

CONTINUATION OF THE
BULLETIN OF THE NUTTALL ORNITHOLOGICAL CLUB

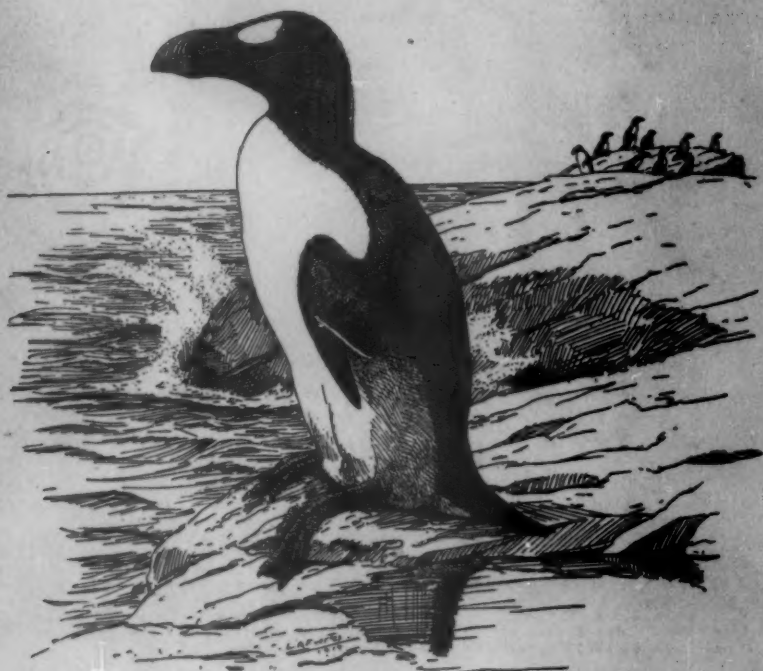
The Auk

A Quarterly Journal of Ornithology

Vol. 55

JANUARY, 1938

No. 1



PUBLISHED BY

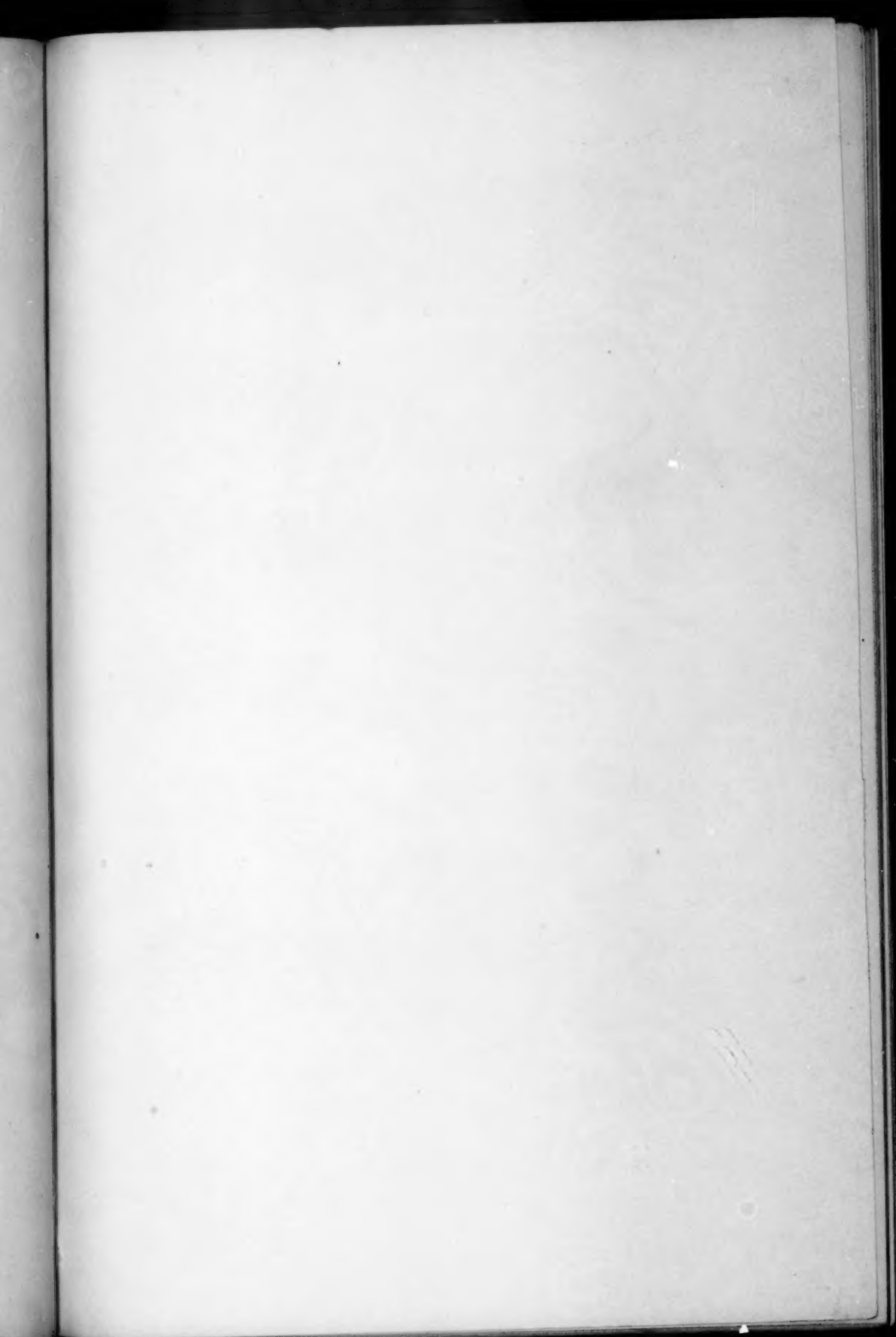
The American Ornithologists' Union

LANCASTER, PA.

Entered as second-class mail matter in the Post Office at Lancaster, Pa.

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G. M. S. del.

ODDLY PLUMAGED ORIOLES FROM OKLAHOMA

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ODDLY PLUMAGED ORIOLES FROM WESTERN OKLAHOMA

BY GEORGE MIKSCH SUTTON

Plate 1

BAIRD, BREWER, and RIDGWAY ('A History of North American Birds,' vol. 2, pp. 195-196, 1905), discussing the plumage of the adult male Baltimore Oriole, *Icterus galbula* (Linnaeus), describe specimens from western Kansas that "have the middle wing-coverts pure white instead of deep orange"; specimens from Pennsylvania in which the middle coverts are "more or less white"; a specimen from Illinois whose "middle coverts, like the lesser, are pure plain orange," but whose head has "a distinct indication of an orange superciliary stripe"; a specimen from Nebraska in which the middle coverts are "pure white" and "the black throat-stripe is almost separated from the black of the cheeks by the extension forward of the orange on each side of it"; and a specimen from New Jersey in which the middle coverts are white "and the lesser wholly uniform black." Evidently considering white middle coverts, black lesser coverts, and orange head-markings to be something in the nature of individual variations, these authors make it clear that seven specimens from Pennsylvania which have white middle coverts "have invariably less intense colors than those with orange shoulders," while in Kansas specimens "the other colors are of the brightest character." They do not, however, concur with J. A. Allen (who collected the Kansas birds) in believing that such brightly colored western birds belong to "a race peculiar to the plains." A. C. Bent ('Summer Birds of Southwestern Saskatchewan,' Auk, vol. 25, p. 29, 1908), writing of birds encountered in southwestern Saskatchewan, expresses a belief that certain orioles he identified as *Icterus galbula* might have been abnormally plumaged Bullock's Orioles, *Icterus bullocki* (Swainson), and quotes Dr. Louis B. Bishop to the effect that a certain specimen which had "the malar region, auriculars and sides of head black and many feathers of sides of neck tipped with black," was "probably a hybrid with *galbula*."

During the spring of 1936 the writer collected a series of nine breeding male orioles in the vicinity of Arnett, Ellis County, Oklahoma. Seven of

these he provisionally called Baltimore Orioles, two he called Bullock's Orioles; but, realizing that not a single bird of the nine was quite normal in color, he was dissatisfied with this identification. Wondering if these oddly colored birds could be hybrids, he showed them to his friend, Mr. John B. Semple, who graciously offered to assist in procuring more specimens through sponsoring an ornithological survey of Oklahoma during the spring of 1937. The four members of this expedition, Mr. Semple, Karl W. Haller, Leo A. Luttringer, Jr., and the writer, centered their attention upon Baltimore and Bullock's Orioles while in the western part of the State, and collected a series of twenty breeding specimens. These twenty birds, together with ten collected in 1936 (the nine above-mentioned Ellis County birds together with a single *bullocki* taken in Cimarron County), present an interesting picture to the taxonomist. Twenty-one of the thirty are fully adult males in handsome, bright plumage. Seven are breeding males in what usually is called 'subadult' or 'first breeding' plumage. Only two are females. Most of the thirty birds are, of course, from Ellis County, not far from the Texas State Line; seven are from Roger Mills County, the county just south of Ellis; two are from the vicinity of Gate, Beaver County, at the eastern edge of the Panhandle; three are from Cimarron County, only a mile or so from the New Mexico State Line; and one is from Logan County, in the central part of the State. The three fully adult males from Cimarron County are *bullocki*. The single male from Logan County is brightly plumaged *galbula*. But the other twenty-six birds, the two females included, present such a strange mixture of *galbula* and *bullocki* characters that the writer finds it quite impossible to identify many of them.

Typical adult male *bullocki* and typical adult male *galbula* are strikingly different. The head of *bullocki* is boldly marked with yellow-orange; that of *galbula* is black. The wing of *bullocki* has a large white patch composed of the wholly white middle coverts and largely white greater coverts; that of *galbula* has a single white bar. The tail of *bullocki* is largely yellow, with black middle feathers; that of *galbula* is largely black, with yellow, or yellow-orange, corners. An important character, which often is overlooked, is the color of the lesser coverts. In *bullocki* most of these are black, in sharp contrast to the white of the middle and greater coverts; in *galbula* they are orange. This means that flying *galbula* is almost as distinctly 'epauletted' as a male Red-winged Blackbird, *Agelaius phoeniceus* (Linnaeus).

Adult female *bullocki* often resemble adult female *galbula*, but tend to be larger, grayer (less yellow or orange-yellow) on the belly, less brightly colored above, and lighter, if not actually more colorful, about the face. Adult female *galbula* usually have more or less extensive black facial markings. The face of female *bullocki* practically never is so marked, though the throat often is black.

The appearance of six specimens in our series of twenty-one fully adult males is shown in the colored plate¹:

Figure 1 represents a specimen (GMS 7539) collected near Mulhall, Logan County, June 3, 1937, which the writer has identified as *galbula*. Figure 2 represents a specimen (KWH 371) collected near Cheyenne, Roger Mills County, May 14, 1937. In arranging the series so as to show transition from *galbula*- to *bullocki*-type of coloration, the writer placed ten specimens between those represented by Figures 1 and 2; but of these ten, four have a certain number of black lesser coverts, as do *bullocki*; in eight of the ten, orange-yellow invades the black of the head and neck; and in six of the ten, the white of the middle and greater coverts is far too extensive for normal *galbula*. Figure 3 portrays a specimen (GMS 7434) collected near Gate, Beaver County, on May 18, 1937. Only one specimen of our series is intermediate between those represented by Figures 2 and 3. Figure 4 shows a bird (GMS 7358) collected near Cheyenne, Roger Mills County, May 10, 1937. Figure 5 shows a bird (GMS 6905) collected at Arnett, Ellis County, June 10, 1936. The specimens represented by Figures 3, 4 and 5, lie side by side in our series. Figure 6 shows typical *bullocki*. Though a certain specimen (GMS 6872, Kenton, June 3, 1936) was chosen by the writer as a model, all three of the Cimarron County birds have this appearance. Specimens like *bullocki*, from Ellis County (KWH 403) and Roger Mills County (GMS 7393), lie between the birds represented by Figures 5 and 6 in our series; in both of these the lesser coverts are mixed black and yellow, there is a considerable amount of black in the outer rectrices, and the greater coverts have too much black in them for typical *bullocki*.

Most of the seventeen specimens that are neither typical *galbula* nor typical *bullocki* are definitely too large for *galbula*. The largest measures: wing, 103 mm.; tail, 83; the smallest: wing, 97 mm.; tail, 76; the series averages: wing, 99 mm.; tail, 81. Curiously enough, both the largest and the smallest birds of the series are of *bullocki* type of coloration. According to Ridgway ('Birds of North and Middle America,' vol. 2, p. 311, 1902), average male *galbula* measures: wing, 97 mm.; tail, 75.9.

SUBADULT MALES

Male *bullocki* and *galbula* in their first breeding plumage are known to vary so greatly that the writer feels it advisable to dismiss the seven subadult breeding specimens of the present series with a brief description. All seven of these birds were collected in Roger Mills and Ellis Counties, in the

¹ The writer wishes it understood that though considerable care was used in the preparation of the colored plate, no attempt was made to draw the figures *exactly* life-size or *exactly* to any scale.

very region in which fully adult males display the most confusing mixture of *galbula* and *bullocki* characters. One of the seven (GMS 6699) has strongly yellow underparts. All the others are gray-bellied. One (GMS 7396) has almost solidly black head and back, strongly yellow breast, and sharply white or light-gray belly. Every bird of the seven has a considerable amount of black about the head, especially on the throat.

ADULT FEMALES

Neither of the two adult females is readily identifiable, for both are too large for *galbula*, yet rather more like *galbula* than *bullocki* in color. One of them (GMS 7516) is far too bright about the face and too gray above for *galbula*, yet strikingly too deep a yellow throughout most of the underparts for *bullocki*. This bird measures: wing, 94 mm.; tail, 78. The other bird (GMS 7518) tends to have the black facial markings of *galbula*, but is altogether too gray, especially on the sides, belly, back and rump, for that species; it measures: wing, 93 mm.; tail, 77. Ridgway (loc. cit., p. 312) gives the following measurements for average female *galbula*: wing, 88.9 mm.; tail, 68.6.

The two females just described were collected at *their nests*, and their mates also were collected. The mate of the former bird bears a strong resemblance to typical *galbula* in that it has fairly bright, wholly orange epaulettes; but the orange-yellow of the breast invades the black of the neck much as in Figure 2 of our colored plate. The mate of the latter female also resembles Figure 2 of the colored plate; but its middle coverts are largely white, the three outer pairs of rectrices are largely yellow, and the yellow-orange of the breast invades the black of the neck as far as the auriculars.

RANGE OF *galbula* AND *bullocki* IN OKLAHOMA

Mrs. Margaret M. Nice, in her admirable 'Birds of Oklahoma' (Publ. Univ. of Oklahoma, Biol. Surv., vol. 3, p. 169, 1931), calls *Icterus bullocki* a "summer resident in southwestern and northwestern" parts, surmising from the scarcity of early records that the species has invaded Oklahoma within recent years. It is now to be found throughout the Panhandle wherever there is sufficient tree-growth; in the entire tier of counties bounded on the west by the Texas Panhandle, namely, Ellis, Roger Mills, Beckham, and Harmon; and probably in Jackson, Greer, and Kiowa Counties in the extreme southwestern corner of the State.

Mrs. Nice (loc. cit., p. 168) considers *I. galbula* a "summer resident in the northern half of the State," naming Beaver and Cimarron, but not Roger Mills and Ellis among the counties in which it "occasionally" nests. To the best of the writer's knowledge, no Cimarron County specimen of

galbula is actually extant today, though R. Crompton Tate (Proc. Oklahoma Acad. Sci., vol. 3, p. 47, 1923) certainly has recorded it there. The writer (Auk, vol. 53, p. 433, 1936) has recently called attention to the fact that *galbula* is "abundant" in Ellis County. He would have been more accurate had he called these Ellis County birds "*galbula-like*," rather than *galbula*.

Do *galbula* AND *bullocki* INTERBREED IN OKLAHOMA?

What are we to call these oddly colored, off-sized orioles? Are they hybrids? Obviously we have no right to affirm that they are hybrids so long as we have no definite knowledge of their parentage. Collecting the two mated pairs in Ellis County might have furnished proof of interbreeding had the male or female bird of either pair been indubitable *galbula* or *bullocki*. But they were not.

To call these birds that display 'mixed *galbula* and *bullocki* characters' an extremely variable western or 'plains' race of *galbula* (or, for that matter, an eastern race of *bullocki*) is wholly unjustifiable so long as there is a possibility that *galbula* and *bullocki* do interbreed, and until we know with certainty what *galbula* × *bullocki* hybrids look like. Here, then, is a fascinating problem for the geneticist, a problem the more complex because in both *galbula* and *bullocki* a fully adult plumage is not attained during the first breeding season.

In concluding, the writer wishes to repeat certain facts for the sake of emphasis, and to set down two highly significant additional facts:

1. But four of a series of thirty breeding orioles collected recently in Oklahoma are readily identifiable. One of these is *galbula*, from the central part of the State. Three are *bullocki* from the extreme western part of the State. The other twenty-six are not, precisely speaking, either *bullocki* or *galbula*.

2. Birds from this interlying region have much the appearance of hybrids between *bullocki* and *galbula*.

3. Both *Icterus galbula* and *I. bullocki* have invaded western Oklahoma within recent years, and neither species, presumably, has yet had opportunity to establish itself firmly.

4. The only oriole song readily recognizable to the writer in Ellis and Roger Mills Counties, Oklahoma, was that of the Orchard Oriole, *Icterus spurius* (Linnaeus). Songs given by Bullock's Orioles and Baltimore Orioles were 'hybrid songs.'

5. In parts of the very region in which these strange orioles were collected, the eastern Indigo Bunting, *Passerina cyanea* (Linnaeus), and western Lazuli Bunting, *Passerina amoena* (Say), were actually found to be interbreeding.

The author wishes to thank Mr. William Montagna for assistance in measuring the specimens described in this paper; and the authorities of the Carnegie Museum, the Royal Ontario Museum of Zoology and the American Museum of Natural History for courtesies extended.

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SOCIAL BEHAVIOR OF THE BLACK-CROWNED
NIGHT HERON

BY G. K. NOBLE, M. WURM AND A. SCHMIDT

Plates 2-4

THE Black-crowned Night Heron (*Nycticorax nycticorax hoactli*) is a common American bird and its life history has been intensively studied by Gross (1923), Bent (1926) and others. Nevertheless an analytical study of its social behavior has not previously been attempted. Recently Lorenz (1934, 1935) has made such an analysis of the social behavior of the European Black-crowned Night Heron, which is only subspecifically different from the American race. One would naturally assume that the behavior of the two forms would be very similar if not identical, but various details of the behavior of the American race as given by Gross (1923) do not agree with Lorenz's description of the European bird. It has therefore seemed advisable to recheck the life history of the American race, considering not only the social behavior of the adult but also the ontogeny of these behavior patterns in the immature. This investigation was supported by a grant from the Committee for Research in Problems of Sex, National Research Council.

THE PROBLEM

The Black-crowned Night Heron is a species of especial interest because Lorenz considers that the greeting display of this bird illustrates his term 'releaser' in an ideal manner. The 'ornamental plumes' arising from the crown of the adults serve, according to Lorenz, not for purposes of mutual stimulation as Huxley (1921) would assume but to suppress a strong defense response which is supposedly evoked in this heron by the approach of any fellow member of the species. Immature Night Herons lack the dark crown and white plumes of the adults but Lorenz assumes that as they grow older they display the bowing movements toward their parents in order to suppress attacks which their parents might make. The movements appear in ontogeny before the plumes which are destined to have functions never previously attributed to the plumes of any bird. Night Herons have been assumed to exhibit a pecking order (Schjelderup-Ebbe, 1931), that is, a social hierarchy which has been intensively studied in the hen, pigeon and a few other domesticated birds (Allee, 1936). Lorenz has not considered what rôle, if any, these plumes or gestures might have in regulating the pecking order, nor has he considered the courtship of the Night Heron in full, although he denies that the plumes have any function as adornments at this time. In studying the social behavior of the Night Heron we have

paid especial attention to (a) the ontogeny of social behavior, (b) the pecking order and (c) the courtship behavior.

FIELD OBSERVATIONS ON THE IMMATURE

Field observations which we made on immature herons at Orient, Great Neck and Massapequa, Long Island, during 1936 and 1937, showed at once that the social behavior of this race is far more complex than Lorenz has described in the European form. As the young grow older they readily leave the nest and take a position close to the tree trunk a few feet above the nest. If approached at this stage, they usually climb higher in the tree or make their way clumsily to another tree. Most of the young of the Orient colony were in this stage July 8, 1937. Approximately a week later, as the young begin to fly, a profound change takes place in their social behavior. Such a stage was seen in the majority of the young in the Massapequa colony, July 9 and 10, 1937. The young are now widely spaced vertically on the boughs of the nesting trees. Other young birds are making short flights to these trees and there are numerous disputes and vigorous thrusts of bills as a newcomer lands near a resident bird. Gross (1923) has interpreted these disputes as primarily over food. He states: "When the young were hungry, they were also irritable, and the least disturbance by a neighbor would cause them to render a defensive thrust accompanied by a ghastly, sharply accented 'Sque-e-e-e-e-ak'." If the birds are in this early flying stage it will be readily observed that the dispute is over territory and not food. Exactly the same behavior is found among the adults when defending nesting areas. When the young are in pairs the resemblance of their behavior to that of paired adults is even closer.

The frequent occurrence of groups of three on mutual good terms defending their immediate vicinity against new arrivals, leads one to suspect that these are young of the same brood which have not left their natal tree. This interpretation leads to the question, Do the young recognize their brothers or sisters when not on their home tree? Do the numerous cases of single birds defending their territories against all comers represent broods where only one survived, or has the family group disintegrated leaving each bird fighting for its own perching site? The fact that one bird can move close to another without resistance while another may be attacked, shows that there is individual recognition. Neither Lorenz nor Gross found evidence of such recognition and neither interpreted the behavior of the young in terms of juvenile territory defense. It was primarily to secure evidence of this territorialism of the young heron that we have reared thirty-eight individuals taken from nesting trees before they could fly and have followed the ontogeny of behavior pattern for over a year. Since fourteen of these young herons bred the following spring we have observed nearly a full

juvenile cycle in these birds. The juvenile birds in the field were not banded and their sex was unknown. We shall therefore base our description of the ontogeny of social behavior on the birds reared in captivity. Many of the details of behavior seen in the laboratory were also witnessed in the field and reference to these details will be made below under various headings.

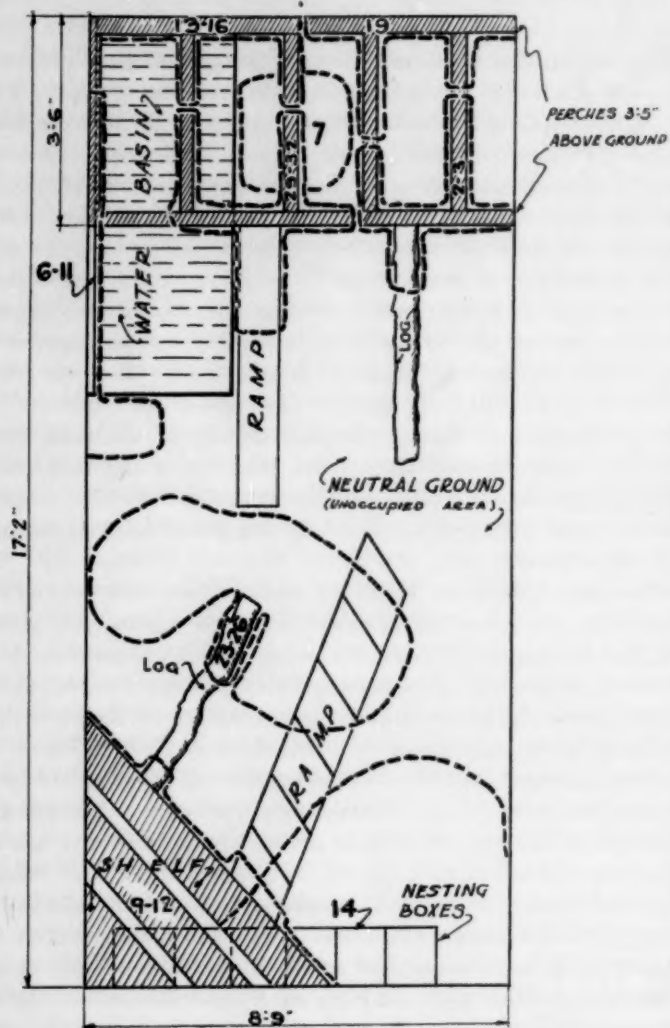
TERRITORIALISM AMONG YOUNG HERONS

We have studied the development of the type of territorialism described above, in a series of young herons maintained in large cages. Twenty-nine young ranging from five to fifty days of age, to judge from the description of Gross (1923), were divided into two lots, of which one was placed in indoor and the other in outdoor cages. Both groups were given artificial nests and marked with colored bands. Very soon the older birds began to leave the nests and to establish well-defined territories which they defended against the encroachment of other young birds. The four outdoor cages were provided with boxes and irregularly arranged logs, boards and potted shrubs. Cage 1 measured 199 by 85 by 88 inches and was equipped with perches from one to six feet from the floor. Cages 2 and 3 were both 206 by 105 by 75 inches with most of the perches three and a half feet from the ground. The ground plan of Cage 2 is shown in text-fig. 1. All cages were provided with large water baths. Cage 4 was constructed after most of the young birds had left the artificial nests. It measured 218 by 132 by 134 inches and was equipped with perches from one and a half to seven and a half feet from the ground.

The oldest birds (Nos. 17, 18, 19) on later dissection, proved to be males. They were approximately fifty days old at the beginning of the experiment and soon after secured the most isolated and highest perches in Cages 1 to 3. Other birds when approximately seventy days old moved away from the artificial nests and formed the first pairs (Nos. 21-22, 20-14, 9-12, 1-4, 2-3). A younger group, approximately thirty days old (Nos. 6-7-9-10-11-13-16), remained grouped near the nests along the wall while the older birds were securing territories. Each of these groups, either as a large group, a pair, or a lone bird, defended a territory several feet in diameter against the encroachment of any bird of any of the other groups. The oldest and most aggressive birds (Nos. 17, 18, 19 and pairs 1-4, 2-3) guarded the largest areas, often the whole width of the cage. When the observer entered the cage the birds would leave their territories and form a highly agitated group in one corner of the cage. Within a minute after he had left, the birds would return to their respective territories and defend them by vigorous thrusts and squawks against trespassers.

The territories were not secured suddenly but often by slow adjustment to the other birds in the cage. For example, the birds at the time of leaving

GROUND PLAN OF CAGE II SHOWING -
TERRITORIES OF IMMATURE NIGHT HERONS
(OUTLINED WITH DASH LINES)



TEXT-FIG. 1.

the nest seemed to form five major divisions: (a) Nos. 9, 12, 14, 17, 18, 20; (b) Nos. 6, 7, 8, 10, 11, 13, 16; (c) Nos. 1, 4, 5, 23, 25, 26, 27; (d) Nos. 2, 3, 19, 21, 22, 24a, 28; and (e) Nos. 24, 29, 31, 33, 34, 35, 36. As stated above, Nos. 18 and 19 early isolated themselves from these groups but No. 17 was first grouped with 14. Other pairs which formed and broke were Nos. 20-14, 20-9, 10-8 and 10-7.

The immediate cause for the splitting up of the large groups into smaller lots was the greed of the young birds. At about fifteen days of age the young herons begin to snatch at food brought them instead of merely shaking their heads and bobbing with widely open mouths in the manner of very young herons. In the latter, discrimination is poor and they will attempt to swallow pieces of wood or the hand of the observer. Often two young birds will attempt to swallow the wings, neck or feet of a third. Undesirable objects which can be swallowed are later regurgitated. The young birds stuff themselves until part of the food is protruding from the mouth. Even then the sight of more food will induce new feeding movements. At approximately forty days of age the birds prefer to pick up food for themselves and are usually reluctant to feed from the hand. With the change of behavior there arises a type of intimidation call which is directed toward driving other young birds away from the food.

The food cry of the young heron at the time it leaves the nest is a persistent cackle which may be written *kak-kak-kak-kak-kak* rapidly repeated and persisting while the observer is present. It is accompanied by a slight waving of the head sideways or vertically. The intimidation call is a continuous chesty gurgle given while the body is held low and the wings are slightly raised and spread. The intimidating bird steps sideways toward the offending neighbor, gently pushing with the spread wings.

This intimidation display is directed only toward one of the bird's own group. When the birds have become further separated a very different response occurs which is a clear indication that one or both birds have separate territories. Again the body is held low but the wings may or may not be spread. The head is drawn back over the body and the mouth is opened wide while the feathers of crown, neck and back are erected. Then, as the head is darted forward in a vicious peck, a high-pitched screech, or frightening call, is emitted and the mouth again is opened wide. In a less extreme attitude the body is held erect and the feathers of head and neck are raised while a shrill but lower-pitched squawk, or fight call, is given.

In any group of young herons there is one bird that is dominant in the sense that during billing it holds its head higher than the others and in any dispute among themselves the others either withdraw or lower their heads in a subservient manner. A second cause for splitting of the original group is that one of the subordinate birds will no longer lower its head with the

result that the usually observed gentle billing gives way to more aggressive thrusts and finally to typical territory-defense movements.

Approximately seventy days after hatching, the herons begin to fly and much preliminary wing flapping is indulged in. Two pairs (Nos. 21-22, 2-3) were formed at this time and two three-membered groups (Nos. 6-7-11, 24-35-36). The intragroup struggle became more intense. In group 24-35-36 birds Nos. 24 and 36 clicked their bills loudly while billing one another and held themselves tense and erect. Previously No. 36 had submitted to 24 by gradually lowering its head when the two billed. The failure of No. 36 to assume the subordinate position of head soon resulted in an exchange of vicious pecks between the two and No. 36 was driven from the territory. Consequently pair 24-35 formed. Similarly one bird was observed to be driven from the territory of Nos. 1-4-5 and 6-7-11 with the result that pairs were produced. All the pairs of immature herons, excepting those resulting from the forced pairing to be discussed below, were derived from the nestling groups to which both birds belonged.

Once a bird had been driven from a group it retained some memory of its early associates because much later when frequent changing of the bird's territory by the experimenters tended to break down territory distinctions, some regrouping occurred. Thus pairs 5-28, 27-25, 6-11 and 7-11, which were well defined for several weeks, later formed the groups 5-27-28 and 6-7-11. The regrouping of the first of these two lots may have been facilitated by the fact that Nos. 27 and 28 were partly spayed.

The pairs of young birds were usually as well defined as that of breeding adults. Introducing a pair into a cage full of strange birds invariably resulted in their keeping together and establishing a common territory in the new cage. Further, these young birds remembered their old territories when returned to the original cages some weeks later. Thus pair 23-26 recognized and secured their old territory in Cage 2 after having spent 17 days in Cage 1. Pair 21-22 secured their old territory in Cage 4 after being retained twenty days in Cage 2. Pair 5-28, after three weeks in Cage 1, attempted to reestablish their old territory in Cage 2. In this they did not succeed because their old territory had been occupied by pair 29-32. Similarly pair 2-3 regained their old territory in Cage 2 after five weeks absence, but No. 19, after five weeks absence from the same cage, was badly beaten by the other birds while attempting to regain its old quarters.

The strong territory defense of young herons in a cage where competition for space is great, will sometimes induce the formation of new pairs. For example, birds 5 and 28 were transferred to Cage 2 and birds 25 and 27 to Cage 3 before they were paired. These birds, driven by the others, were forced into a common area and being frightened by the new situation they adopted a subservient attitude which facilitated the formation of perma-

nent pairing. Similarly, pressure of environment caused birds 29 and 32, resulting from the induced breaking of pairs 29-31 and 15-32, to form a permanent pair.

Pairing off is not accomplished by the mere juxtaposition of two frightened birds. One bird must accept subordination to the other and, further, the bond between them is frequently strengthened by gesturing and billing of the pair. In this behavior the subordinate bird apparently always takes the lead. The head is lowered and weaved back and forth while the bill is directed toward the side or feet of the dominant bird and clicked. We have called this gesture the 'overture.' It is answered by the dominant bird which usually keeps its head high but may occasionally lower it to the same position as that of the subordinate bird. Overtures are made at frequent intervals. During a period of twenty-one days fifteen pairs of immature birds were observed for approximately six hours a day. The subordinate bird was found to initiate the ceremony 1,406 times. In thirty-one cases the dominant bird was recorded as making the first move, but it is highly probable that the observer, with thirty birds under observation, failed to notice a still earlier overture on the part of the subordinate bird. Thus each pair of birds made overtures approximately five times during six hours of daylight, with the subordinate bird usually, if not always, taking the lead. A modification of this overture is the actual grasping of the latter bird by the first bird with its bill. Another modification is the stroking of the breast feathers of the partner with the bill. A third movement we have described as 'billing.' It consists of the birds' opening and closing their bills while they are held in contact. During this movement the dominant bird always holds its head higher than that of the subordinate. These movements, although started by the subordinate bird, induce a similar movement by the partner. Once a pair has formed, neither billing nor overturing is necessary for the maintenance of this condition as we shall point out below.

A variety of calls may be given by either member of a pair and as we shall show, these aid in the retention of a group. The one most frequently employed is the recognition call, which may be written as *krwawrk-krwawrk-krwawrk*. The second is a throaty and prolonged variation of the familiar *quawk* or flight call of the species. This occurs between birds which have recently driven off a stranger or with members of a pair which have come together after a separation. The third call is a combination of food and flight calls and occurs when one bird of a pair moves off and its partner wishes to recall it. A fourth is a combination of the food and intimidation cry. It is usually given when two herons are standing beside each other and is usually followed by a bout of billing.

RELATION OF SEX TO PAIR FORMATION AMONG JUVENILE HERONS

Sex was determined at the close of our studies by a direct examination of the gonads of the paired birds. As shown in Table 1 there were thirteen male-female, six female-female and two male-male pairs. The gonads were rudimentary in all cases. Sections revealed some spermatids but no sperm in the testes. No yolk had yet formed in any of the ova.

As stated above, no pairs of young birds formed without one bird becoming subordinate to the other. Once a bird had taken such a position as shown by (a) the lower position of its head during mutual billing and (b) its initiating overtures to its partner, this position was never lost while the grouping was maintained. In the heterosexual pairs the male was usually the dominant bird. The three cases of reversed dominance find an explanation in the special handling the birds received. That is, male No. 11 was a very tame bird which was frequently petted by visitors to the cage. This would account for his taking a subservient attitude to females Nos. 6 and 7. Pair 29-32 was a forced pairing following the experimental breaking of pairs 15-32 and 29-31. Such a forced pairing of formerly paired birds probably never occurs in Nature. Our observations at three different colonies indicated that when competition for space became very severe the bird losing the fight moved on to new territory. Hence we may conclude that in the sexually immature heron the male has a decided tendency to dominate the female. This dominance has no relation to body weight; it is a characteristic of maleness in the Night Heron.

TABLE 1

Relation of Sex to Pair Formation in Immature Night Herons

Heterosexual Pairs		Homosexual Pairs	
Dominant	Subordinate	Dominant	Subordinate
<i>Male Dominant</i>		<i>Female Pairs</i>	
13 ♂	16 ♀	23 ♀	26 ♀
24 ♂	35 ♀	5 ♀	28 ♀
21 ♂	22 ♀	Br ₁ ♀	Br ₂ G ♀
36 ♂	33 ♀	12 ♀	9 ♀
15 ♂	32 ♀	8 ♀	7 ♀
29 ♂	31 ♀	12 ♀	14 ♀
10 ♂	7 ♀		
10 ♂	8 ♀		
27 ♂	28 ♀		
27 ♂	25 ♀		
<i>Female Dominant</i>		<i>Male Pairs</i>	
6 ♀	11 ♂	2 ♂	3 ♂
7 ♀	11 ♂	1 ♂	4 ♂
32 ♀	29 ♂		

SENSORY MODALITIES EMPLOYED IN PARTNER RECOGNITION

Young herons remember not only their old territories but their partners for long periods as the following experiments show.

(a) The two herons of pair 5-28 were separated for 72 hours. When the birds were placed with many other herons in their original cage they re-formed within twelve hours.

(b) Birds of the same pair separated 96 hours and then placed together with many other herons in a cage previously unoccupied by them, again re-formed within twelve hours.

(c) The two birds of pair 23-26 isolated for seventeen days and then replaced in their original cage with other herons, re-formed their group within twelve hours.

(d) The two herons of pair 21-22 separated for twenty days and then placed in a cage strange to them re-formed their group within three hours. When returned to the original cage they attempted to retrieve their old territory but after being driven out by the herons occupying it, they marked out a new territory in the old cage and continued to defend it.

It is therefore clear that young herons can recognize their old partners after a separation of at least twenty days. The sensory modalities employed in this recognition could not be determined from observation alone. Some preliminary experiments were directed toward modifying the responses of one bird to its partner by covering the bill of the latter with bitter substances. Neither an extract of aloe nor concentrated solutions of quinine sulphate had an effect on the mutual ceremonies. We were equally unsuccessful in modifying the response by using ill-smelling substances on the feathers. Attention was then directed toward the visual and auditory modalities for these are well known to be of primary importance in the life of most birds. Young herons were found to be much less disturbed by profound changes in the appearance of their partners than has been reported for other birds. Beaks of various individuals were painted brilliant red or blue, the legs were striped with blue, orange and white without bringing any deviation in the reaction of one member of a pair to its partner. When, however, the entire face was covered with either a bright-red or yellow rubber balloon leaving only the eyes and bills exposed, the masked bird induced fright reactions in its partner. But in every case the masked bird had merely to call a few times to reassure its partner before billing and gesturing began again in the normal manner. Merely covering the crown of a young heron with a piece of adhesive tape stained with iodine brought confusion at first to its partner. Since such a modification of appearance was much less conspicuous than the painted bills, it seemed that the young herons paid especial attention to the detailed feathering of the head. However, when most of the head and neck feathers of one member of pair 5-28

were removed and replaced by head feathers from much younger herons, no permanent confusion resulted. In these cases it was obvious that the recognition of the partner's voice, coupled in some cases with the mutual recognition of territory were the bonds which brought them together.

The human observer is unable to distinguish any difference between the voices of the different herons when they were using one type of call, or at least we never succeeded. The birds, however, were able to make this distinction and they require the stimulation of the partner's voice for a synchronization of the mutual ceremonies. Plugging their ears with cotton covered with rubber cement and then bringing the adjacent skin together over the cement with a single stitch proved to be an effective way of eliminating sound without disturbing the birds. Such birds were found not to respond to sounds made by a hidden observer, and their reactions to their partners indicated an obvious deficiency in hearing.

RELATION OF VOICE TO THE BILLING CEREMONY OF YOUNG HERONS

As stated above, it is the subordinate member of each pair which overtures to its mate and this often leads to billing. Although the subordinate bird bows, if its partner has its ears plugged, there is rarely any response from the partner. Birds with plugged ears stand together and defend their territory against trespassers. Further, if introduced into a strange cage, they will mark out a new territory and sometimes defend it together. Hence, overturing and billing are not necessary for partner recognition or mutual territory defense. The response of the dominant partner is to the sound and not movements of the subordinate bird, as the following experiments show.

(a) Pair 23-26 have ears closed with cotton, rubber cement and a stitch. When returned to original territory there is no overturing. When transferred to a strange cage with other herons they occupy a common area and defend it without overturing.

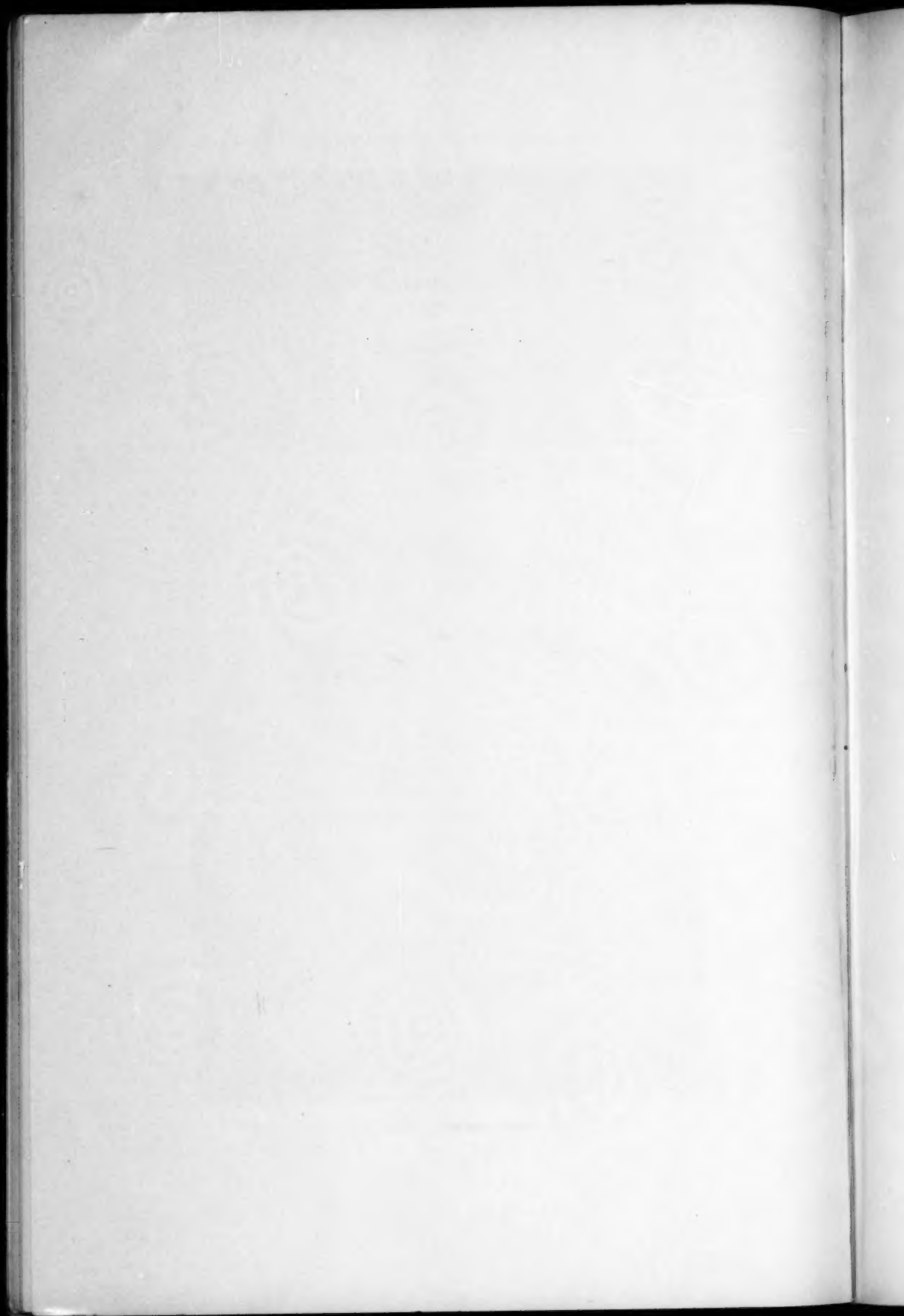
(b) Pair 15-32 have ears closed with cotton and rubber cement only. When transferred to a new cage they take up territory together but do not engage in mutual ceremonies. When ears are opened again the birds begin at once to overture and bill.

(c) Pair 5-28 have ears plugged with cotton and rubber cement only. Head and body of No. 28 sprinkled with blue water color. Pair returned to original territory but No. 5 is frightened by the appearance of No. 28. By the following morning the pair has come together again.

(d) Pair 23-26 have ears plugged in standard way (as in experiment a). No. 23 is masked with a yellow balloon and returned to original cage. Both birds are driven by the other birds in the cage. Within twenty-four hours the pair has re-formed.



YOUNG BLACK-CROWNED NIGHT HERONS



(e) Masking reversed in pair 23-26. Plugs removed from ears of No. 23. The latter is now frightened by its masked partner but when No. 26 calls, No. 23 approaches and they bill. No. 26 seemed to recognize No. 23 by its appearance, and was able to attract the latter by calling even though No. 23 was obviously disturbed by the appearance of the mask on No. 26.

(f) Both birds of pair 5-28 have the feathers of their head and neck replaced by their own breast feathers. Ears plugged in standard way and external nares plugged with rubber cement. When both birds are returned to their original cage now emptied of other herons, they stand near together but fail to overture. Normal herons progressively added fail to separate pair.

(g) Both birds of pair 2-3 have head and neck refeathered with own breast feathers. Ears plugged in standard way and pair transferred to a cage in which they previously held territory. Both birds fight other birds for this territory. Pair transferred to two other cages with other herons reform pair both times although slowly (twelve hours).

(h) Both birds of pair 23-26 with ears plugged in standard way have head and neck refeathered with own breast feathers and are transferred to a new cage. Other herons force them apart, but twenty-four hours later they have come together. They fail to overture or bill.

From the above experiments it is clear that plugging the ears greatly reduces or entirely eliminates the overturing and billing of the pairs. While covering a bird's face with a rubber mask tends to disturb the partner, neither this nor the refeathering of the head and neck with the bird's own breast feathers prevents pair formation even in new territory. Young herons with plugged ears can apparently recognize their partners by other features than those found on the head or neck. Whether this is head and body movement or merely coloration of the body plumage, our experiments have not shown.

EFFECT OF TIME LAPSE ON RECOGNITION OF REFEATHERED BIRDS

Refeathering the head and neck of both members of a pair of young herons does not prevent partner recognition after a lapse of a few hours. This was shown in several of the cases reported above and also in pairs 21-22, 29-31, and 15-32 which in a series of tests had their heads and necks refeathered with breast feathers (Plate 2, figs. A and C) but their ears were not plugged. If, however, these refeathered birds are isolated for six or more days, there is complete failure to recognize partners, as the following experiments show.

(a) Birds of pair 29-31 are isolated in separate cages six days. Color pattern of head is modified by the addition of breast feathers. When

birds are placed in Cage 2 where they had previously held territory, the birds remain apart and show no sign of recognition.

(b) Birds of pair 21-22 are separated for eight days and then have feathers on crown and face replaced by breast feathers. When placed in Cage 4 where they had previously held territory, both birds return to this territory and fight each other for it. There is no evidence of partner recognition. When pair is moved to Cage 2 where they also had previously held territory they return to it and fight violently with each other. The subordinate bird No. 22 is forced by No. 21 and the other birds in the cage to a new corner. At no time, in spite of frequent use of voice, is there partner recognition.

(c) Birds of pair 15-32 are separated for eleven days and then have head and neck feathers replaced by breast feathers. The birds are placed with other herons, first in Cage 2 and then in Cage 1, without showing signs of recognition. In Cage 2, when the birds contacted in an attempt to occupy their common territory, they fight each other.

(d) Birds of pair 2-3 are isolated for thirteen days and then have breast feathers added to head and neck. When returned to home cage they fight between themselves for old territory. The subordinate bird, No. 3, is vanquished and is forced by partner to a new position on the ground. There is no gesturing or sign of recognition by features or voice.

(e) Pair 23-26 have their heads refeathered with breast feathers. When placed in a cage with other herons the subordinate, No. 26, is forced into a corner by the other birds. During a month's stay in this cage the group is never re-formed even when the number of birds in the cage is reduced.

Both pairs 23-26 and 21-22 had been previously tested for partner recognition before the refeathering experiments began. As pointed out above, the latter couple had recognized each other after a separation of twenty days and the former after seventeen days. Young herons, therefore, are able to recognize partners much longer if the feathering pattern of the head and neck has not been modified. Evidence has been presented above that young herons recognize their partners also by differences in voice. In the refeathering experiments reported in this section, the hearing capacity remained unaltered and yet the young herons were unable to respond to the auditory cues after an isolation of six days or more.

Further evidence that auditory cues without adequate visual ones are unable to hold pairs together was obtained by placing single birds of various pairs under screened boxes in a new cage. When the other members of these pairs were introduced into the cage, in no case did a free bird take up a territory near its imprisoned partner even though the latter called loudly. Hence while voice seems to play the major rôle in initiating and synchronizing gesturing, pairs are held together primarily by visual cues.

PECKING ORDER AMONG NIGHT HERONS

In the field we attempted to find evidence for the existence of a pecking order among Night Herons such as Schjelderup-Ebbe (1931) described for "species of herons." When the young herons are beginning to fly they frequently arrange themselves at different heights among the branches of the nesting trees. Since there is an obvious tendency for the young herons to climb upward it seemed that the relative height of any heron in a tree might be an index of its superiority. In the laboratory, however, the earliest maturing young secured the highest perches and defended these against younger birds. The vertical distribution in the field appeared therefore to be an index of age. As many as eleven young herons were found on a single pine at Massapequa, and groups of six and seven were not rare in several other colonies. As soon as the young begin to fly they mark out territories. The owner of a territory has a decided advantage in any dispute with a newcomer. In the field at Massapequa we saw several instances where a young heron successfully defended this territory against an adult. In the laboratory, also, adults fled from the onslaught of a young bird in the latter's territory. It was clear that this infantile territorialism so completely dominated the social behavior of young herons that pecking orders, if they existed, would be very difficult to detect. Certainly in most cases the bird which gave way in any encounter would prove to be the trespasser into the territory of another.

As our experiments with the pairs of young herons continued, some unexpected results were secured. In pairs 29-31 and 15-32, the first-mentioned bird was in each case dominant (Table 1). When these pairs were broken during recognition tests and later crowded with other herons in a strange cage the new pair 29-32 was produced with No. 32 dominant. Since the latter bird was a female and the former a male this reversal was an exception to the rule that males are dominant to females. It therefore seemed possible that there might be present a pecking order in which No. 32 stood higher than No. 29 but below No. 15. Attempts to demonstrate such an order by the usual methods (Masare and Allee, 1934) failed. When food is placed in a cage with the birds they usually fly down to it, one by one, and there is no order of precedence. If the herons are starved for one or more days several birds fly down together and food may be taken by several birds at one moment. The "social reflex runway" described by Murchison (1935) is not suitable for herons because when forced to the ground in a strange environment they do not run toward one another. Similarly the social-discrimination cage employed by Murchison (1935) was found to be useless for herons. We were therefore forced to employ new methods in our study of the pecking order in herons.

If young herons are driven into one corner of a large cage, the birds that

are strangers in that area tend to flee and those which chance to be resident are the first to revolt against the crowding and successfully force all other birds to yield. In order to eliminate superiority due to territory possession, a series of glass-sided cages was utilized. These had a floor space of either 2.8 square feet or 4.6 square feet, that is, smaller than the territory of any one bird. Three herons at a time were placed in each cage and dominance was determined as in the pairs of unrestricted herons. There was no overturing, except when pairs were introduced, but when two herons billed, the bird which kept its head higher was considered to be dominant. Each group of three herons was tested for a whole day and given at least one day's rest before being tested again. The number of billings in any one day by any two herons varied from 0 to 147. Every combination was tested on at least two different days. Birds which reacted very little were tested for as many as ten days.

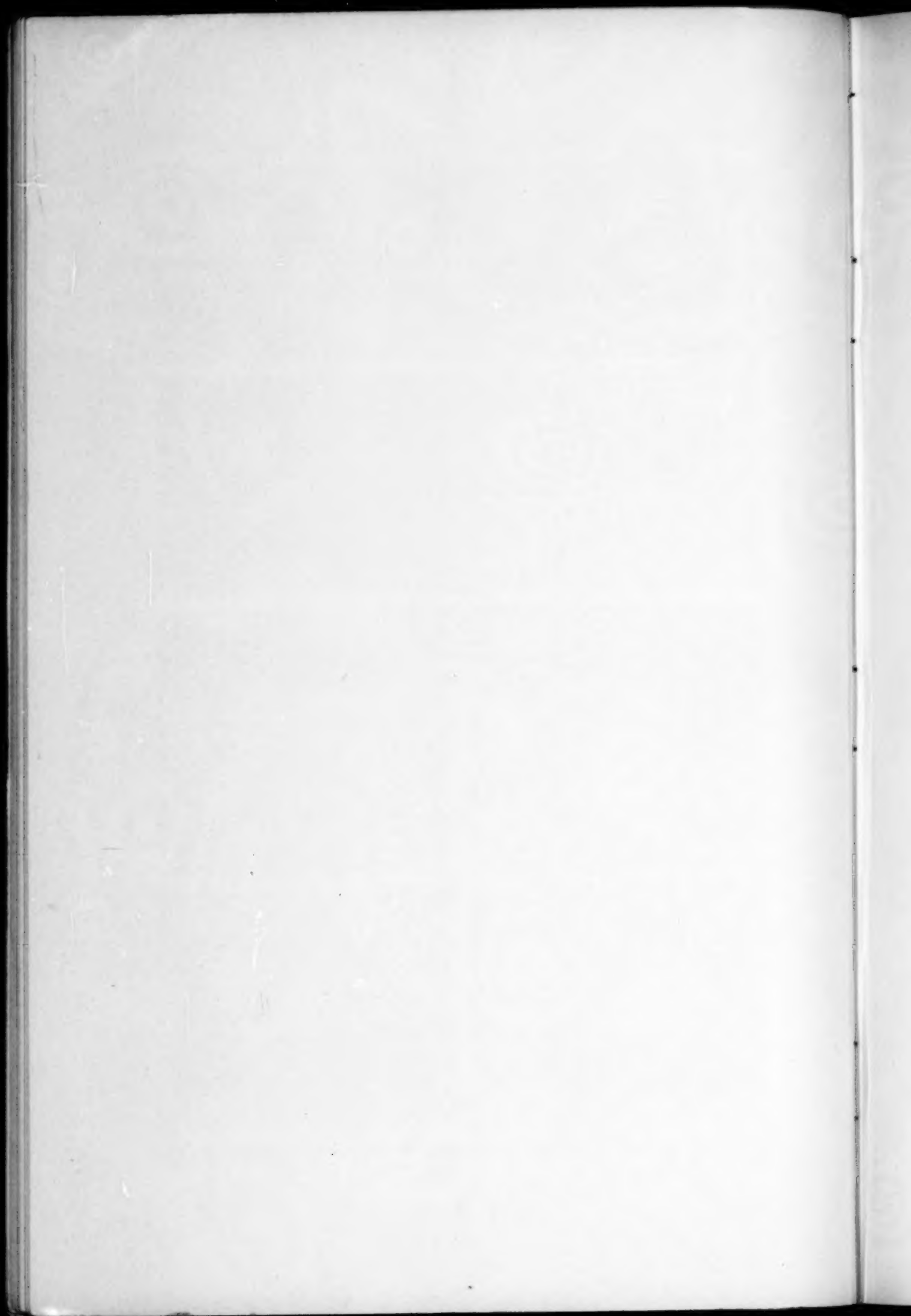
The data secured from introducing fifteen birds, three at a time, in all possible combinations in the small cages are shown diagrammatically in text-fig. 2. In very few cases did a bird which held its head high while billing with one bird, hold its head lower than that same bird when tested again. These cases are shown by the symbol light circle in a black square. In Group A there was only one such pair of birds where the right of holding the head higher in billing had not been decided. Both Group B and Group C (text-fig. 2) included two other such combinations, 6-29 and 29-36. The chief characteristic of Group C was the lack of billing reaction exhibited by the birds. This group was tested on several days and, due to territory-defense reactions and infrequency of billing, dominance relationships were not completely determined. If our criteria of pecking order are correct these birds should be placed near the bottom of the order. Their actual position was determined by the few reactions secured.

Certain other exceptions indicated in the diagram require explanation. The two failures to react in Group A involved No. 24 which was killed in a fight before these reactions could be recorded. This is not to be confused with failure to respond, found frequently in Group C. Since the birds in the latter group had enjoyed the usual isolation that territory defense gives all Night Herons above a certain age, their failure to react cannot have been due to their previous mistreatment by other herons. It seems that birds at the bottom of the pecking order described here owed their position to physical weakness which prevented them from engaging in billing bouts with other herons when forced into their proximity.

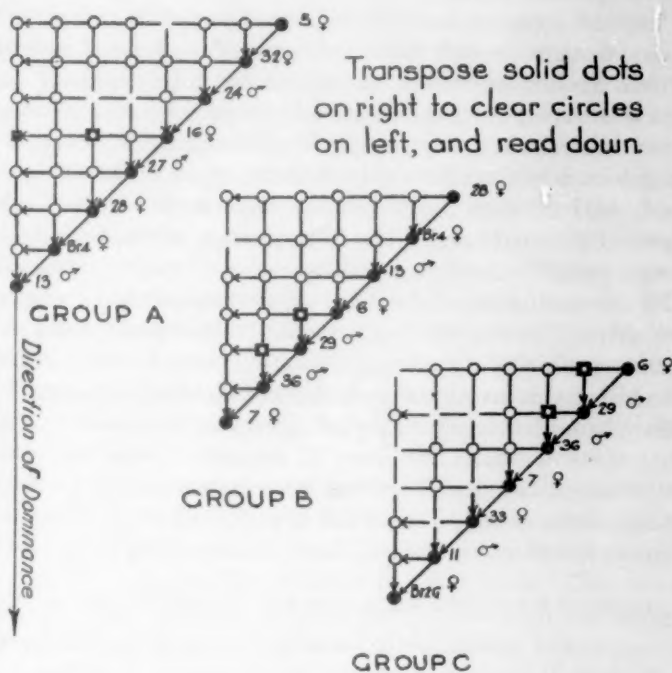
In the entire series of tests there was only one small group of birds which engaged in a 'triangle' formation such as Schjelderup-Ebbe (1931) has described in hens. In Group A, No. 16 is definitely subordinate to No. 13 and yet is clearly dominant over No. 27, No. 28 and Br.4. Nevertheless the



SEXUAL BEHAVIOR OF BLACK-CROWNED NIGHT HERONS



PECKING ORDER AMONG IMMATURE NIGHT HERONS



- ⊕ Dominance Reaction Unidirectional
- ⊞ Dominance Reaction Bidirectional
- Only Reversed Dominance
- ⊖ No Contacts Observed

TEXT FIG. 2

last three birds were dominant over No. 13, the 'tyrant' of No. 16. Such a roundabout sequence of dominance if found in hens would be attributed to one of the social factors elucidated by Schjelderup-Ebbe (1931) but in herons with their marked territorialism other explanations must be sought. This group was an extremely active lot which never quieted down entirely in the experimental cages. It is highly probable that distracting factors, such as the activity of other members of each test group, were responsible for this exceptional result.

The work on these herons continued from October 24 to November 24, and several test groups were run at one time. The advent of molt in some of the birds made it inadvisable to continue beyond this point. Although the work was incomplete it at least showed the presence of a pecking order which owed its existence only partly to previous social experience. That is, Group A includes three pairs of birds (5-28, 13-16 and 27-28) which had previously held territory together in the large cages; Group C, three of these pairs (36-33, 6-11 and 7-11). The position of head in billing in the small cages would be merely a repetition of the thoroughly ingrained habit begun in the nesting area before the aggregations of young acquired the territory drive. But this would not account for the equally well-fixed order of dominance exhibited by birds living continuously in well-marked territories and having no social contacts other than territory defense. It seems then that the birds recognize physical differences unapparent to our eyes and that these determine the order of dominance when any two birds engage in mutual billing. There are, however, some birds which through physical weakness or temperament fail to engage in social contacts and are therefore, as stated above, assigned to the bottom of the order.

COMPARISON WITH THE DOMINANCE AND TERRITORIALISM IN PIGEONS

The sequence of dominance in herons, which we have called a pecking order, regulates the formation of pairs but it seems to be of little practical value in the social life of captive herons once the territory drive has isolated various pairs of young birds. The question arose, Might not territorial rights overshadow the operation of dominance reactions in other groups of birds? In pigeons there are well-marked territory claims (Taylor, 1932) although neither adults nor young fight for these rights in the vigorous manner of herons. Masure and Allee (1934), who have investigated the pecking order in pigeons, found some evidence of this territorialism. They state, ". . . BB always seemed to do the pecking when she was at the entrance of the roost: when BY tried to enter she would be pecked and would retreat. On the ground, however, BY was usually dominant." Schjelderup-Ebbe (1924) pointed out that a bird introduced into the territory of a stranger will become subordinate to the latter. Hence it

seemed to us possible that if we studied pigeons in their own territories, the pecking order would be masked in the same manner as in Night Herons under normal conditions.

For this study four pairs of male and female pigeons were introduced into small cages measuring 23 by 11 by 15 inches and 25 by 19 by 16 inches and two additional males were placed in single cages of the same size. Each cage was screened from the other and provided with one or two perches. The pigeons were well fed for two days and then tested by transferring each male bird into one of the other occupied cages. In every case the resident male charged the newcomer and drove him in frantic distress against the screening of the cage. The experiment was repeated with the four adult females with exactly the same result. An adult female introduced into a small cage which has contained an adult female for two days is vigorously attacked by the resident bird. When the attacked female is returned to her own cage and the former tyrant introduced into this strange territory the resident bird is exactly as dominant as the tyrant was in her own territory. When the experiment was repeated with immature male pigeons, six weeks of age, nearly the same results were obtained. That is, in tests with six young pigeons only one bird (R-G) when introduced into the cages occupied for two days by the other young pigeons, was able to dominate the resident birds and he did so in only two cases. Since this bird swelled its throat while driving, its superiority was probably due to an incipient sex drive.

Repeating the experiment with the adults but recording the heterosexual contacts gave many more exceptions. That is, some resident females were successful in driving introduced males but often they retreated and in some cases permitted the introduced males to tread them. The sexual drive of adult pigeons, therefore, prevents the females from exhibiting strong territorial claims while in the presence of males.

MECHANISM OF SEX RECOGNITION

Male pigeons recognize females by their behavior, as Craig (1968) pointed out long ago. What cues male Night Herons might utilize in sex recognition have not been described in spite of the relative abundance of the species. We therefore planned to study the breeding behavior both in the field and in the laboratory with a view to comparing the mechanism of pair formation in immatures with that of adults.

Eighteen wild adults were secured from the National Zoological Park through the kindness of Dr. W. M. Mann. These birds were first tested in the large outdoor cages where we kept the young until it had been demonstrated that each bird defended its immediate surroundings against the encroachments of other herons and that there were no two birds tending

to occupy the same territory. They were then transferred through the kindness of Dr. Frank M. Chapman to one of the live-bird rooms of the Museum, which has a floor space of 442 square feet and a high overhead ceiling, allowing us to arrange perches from three to fifteen feet from the floor. The birds were maintained in this room at an approximate temperature of 70° F. and fed porgies once a day throughout the winter. The first pair courted February 15, and the last egg of their first set was laid April 3. At this time another pair began to breed and their laying ran synchronously with the earliest ovulation we observed in the field, namely, at the Great Neck colony. Four pairs of white adults laid eggs, four in number at intervals of from forty to fifty hours, in nests of their own construction and at least attempted to rear young. The eggs hatched in from twenty-two to twenty-four days and not twenty-four to twenty-six as stated by Gross (1923). This was probably due to our higher temperature in the bird room. One pair laid twice, each time in a different nest. In addition, seven pairs of first-year birds kept in the outdoor cages built nests and laid eggs. These pairs were formed with new partners indicating clearly that pairing off at the breeding season involves other factors than those which regulate pair formation before the breeding season. One group of three first-year birds built a nest and took turns at incubating the eggs. This group consisted of Nos. 5, 28, 27, birds which had formed a three-membered group during the earlier observations. Later, this group of one male and two females was split at different times into various pair combinations. The mechanism of mate selection at breeding time operates to break up juvenile pairs but in this group of three birds in a cage 150 by 300 by 108 inches not only did the pair 5-27 not break but an old partner of both birds was able to join the nesting pair without interference. The exceptional breeding behavior of this group of birds is probably due to partial spaying of Nos. 5 and 28. Further study on this aspect of the problem is in progress.

The behavior of these breeding herons in both the indoor and the outdoor cages was checked against the breeding behavior of adults in the field, especially at Great Neck. The latter birds were not banded and they could not be captured for the verification of sex. Nevertheless their behavior was nearly identical with that of the captive birds. We found it therefore possible to identify sex in the field by the following criteria, first worked out with the captive birds.

(a) *Plume length*.—In any mated pair the male usually has the longer plumes and sometimes one or two more than the female (Plate 3, fig. G and Plate 4, fig. B). This was true for six of the seven pairs of adults in the laboratory. In all of the first-year breeders the male had a short plume and the female none at all. In the one exception, the female had a plume three inches long and the male none. A careful check of fifty-six breeding pairs

at Great Neck, using two or more of the criteria listed below, revealed fifty-two with longer plumes in the male, three with them equally long and one with the female having an advantage in plume length.

(b) *Twig ceremony*.—The male standing over a crude nest platform, or at a distance from it, holds a stick in its bill and loudly snaps its bill on it while its head is moved rhythmically up and down. Frequently the neck is stretched vertically upward to nearly its full extent and the bill brought in close to the neck while the snapping continues. Although the stick may eventually be placed in the crude platform it is more often dropped.

(c) *Snap-hiss ceremony*.—The unmated male while standing alone on a nest platform but more usually while moving alone about a tree, takes two or three steps forward, halts, arches the back, lowers the head until the bill is nearly as low as its feet and then while raising one foot produces a click or snapping sound in its throat, immediately followed by a prolonged hiss. The performance is repeated while either the same or the opposite foot is raised. From eight to ten performances may be given a minute and the series lasts over two minutes, to be followed a minute later by another series. In the laboratory we were present when this call was produced by male RB of pair F, male BH of pair G and by two other males which remained unmated throughout our studies. The call was also given by one of the first-year birds (RB-G) immediately before it secured a mate. In the field the call was heard many times and on four occasions we followed its author for long periods, making sure the bird had no mate. It is therefore assumed to be characteristic of the male before he secures a mate.

As a modification of this call may be listed the *peck-hiss* which represents a combination of the usual peck of territory defense with the snap-hiss ceremony. It is given by the male soon after a female has joined him and before the paired condition is fully established. It was best seen among our birds in pair F but was also heard in the field.

(d) *Overture and display*.—When a female arrives in the vicinity of the breeding male he overtures and displays. The overture is identical with that of the juvenile bird except that the male often turns his head until one cheek is parallel with the ground (Plate 3, fig. C). At the same time the male utters a greeting call more guttural than that of the female or immature and less prolonged. The head is then raised and the feathers on crown, neck and back are raised. At the same time the pupil is contracted and the eyeball actually protruded from its socket, exposing the red iris to its maximum extent. The plumes are erected and may even fall forward over the head as the male bows again to the female and either repeats the greeting or turns his partly open mouth toward her. The female in turn repeats the salutation including the overture, feather raising, plume erection, pupil contraction and eyeball protrusion, but her lower-neck feathers do not

protrude or extend so far laterally as those of the male and her higher, more prolonged salutation distinguishes her at once from the male (Plate 3, figs. D-G). Only when both birds call loudly together do their voices seem alike. The male usually overtures first and he holds his head lower than does the female. When, however, he displays he usually holds his head higher than does the female. If the overturing is followed by billing the male still holds his head higher. At the beginning of courtship the female may not display at all.

(e) *Copulation*.—This act is not immediately preceded by any display or sound on the part of either bird. The female merely stoops and the male steps forward on her back and with shuffling movements of his feet secures a grip on her humeri or shoulders while bringing his tail sharply down and turned toward the female's cloaca. He always assumes this dorsal position except in the case of homosexual unions to be described below.

The formation of pairs was witnessed both in the field and in the laboratory. In the latter the females came directly to males which were guarding crudely built nest platforms chiefly of their own construction (Pairs C, D, E and F). In the field, although the males may take up positions near old nests, the females seem to be attracted by the snap-hiss ceremony and not by the adjacent nest. The following observation made at Great Neck, April 19, 1937, will illustrate: "A bird, apparently a male, moves from limb to limb of a tree while giving the snap-hiss call. Between calls he would break twigs and fumble them in a modified stick ceremony. A second bird with very pink legs flies to the tree and moves toward the performer. A third bird flies in but is immediately driven off by the second bird which is content to remain near the performer."

In the laboratory most of the males which secured mates engaged in a long twig ceremony over a period of several days before females entered their territories. In the field many single birds were seen engaged in this ceremony but we could not be sure that no females had yet entered their territories. The behavior in the field differed from that in the laboratory chiefly in that birds flew about more to the different trees. There was considerable settling down in other birds' territories and a hasty retreat when the resident birds returned. A resident bird, seeing a stranger on its territory, may fly low and give a rasping call which appears to serve as a warning. This is the only call given by birds in the field which we did not hear in the laboratory.

On the basis of the above criteria for the recognition of sex we may describe the sequence of events which takes place in the courtship of the Black-crowned Night Heron. This represents a composite picture of many observations made at Great Neck during April and May interpreted by means of data secured in the laboratory. When flocks of herons return

from winter quarters early in spring they settle down on or near trees which contain last year's nests. Each bird selects a certain territory in accordance with the territorial requirements found even in immature herons. The males soon make themselves conspicuous by developing two new types of behavior pattern: (a) the twig ceremony which may be considered 'symbolic' of nest building; and (b) the snap-hiss ceremony which borrows no elements from any other behavior. The breeding female is attracted by one or both of these performances and settles down on the tree occupied by the male. Out of the breeding season the male would not tolerate this approach but the sex drive has reduced him to an apparent lower position in the pecking order. Instead of attacking, he adopts the attitude of a subordinate bird and overtures to the newcomer. At the same time his changed physiology has modified his greeting to a guttural call which further reveals his sex. As the female lingers in this unguarded territory the male returns to his state of dominance by an elaborate display. This consists of raising feathers of crown, neck and saddle as well as the long plumes of the head. He bows, his pupils contract, eyes bulge and mouth gapes. The latter behavior patterns are available to the female and the male's gestures stimulate her to respond in kind. Neither her plumes nor neck feathers equal those of the male in extent of spread and the male gradually raises his head with frequent displays until he has regained the same advantage in head posture seen in the dominant bird of immature pairs (Plate 3, figs. C-G).

The method of pair formation, while totally different in adult from that in immature companion pairs, results in the male of heterosexual breeding pairs being always dominant. The display, however, has other functions besides returning the male to his dominant position. Observations in field and laboratory indicate that the act of copulation often fails because of lack of cooperation of the female. It is obvious that the male's display stimulates the female for she replies with higher voice and lesser display. It would seem, therefore, that the second function of the display is to raise both partners to the same emotional level in order that the female should bend her body parallel to the nest and permit the deliberate, shuffling movements of the male.

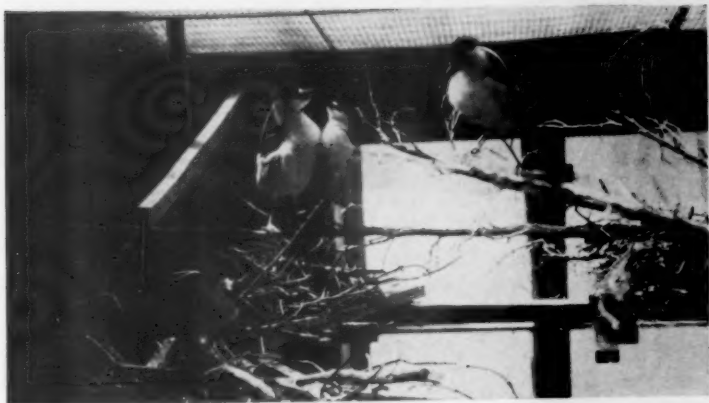
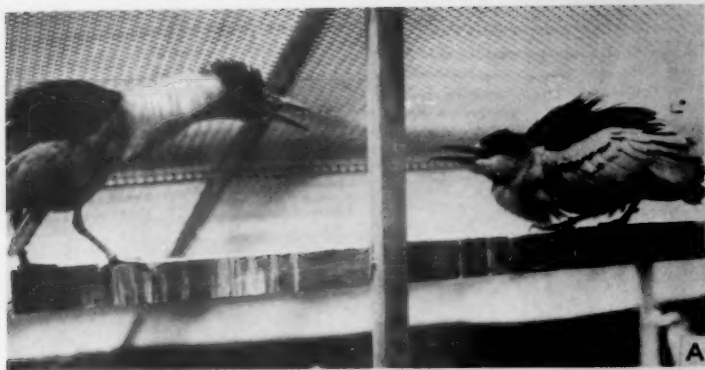
The male's twig ceremony changes gradually to nest-building activity (Plate 3, fig. B). As the nest progresses the male may bring twigs to the female which remains in the nest and actively builds. This stick-passing probably functions as another bond to hold the pair together. The male is greatly stimulated by the sight of an egg in his nest, even one taken from another nest before his mate has laid. He at once begins to brood and in the laboratory cages only males brooded during the daytime of the first few days of incubation. Later the female assumed most of the daytime brooding duties and, in a few cases in the laboratory, would remain on the nest until touched.

HOMOSEXUALITY IN ADULT NIGHT HERON

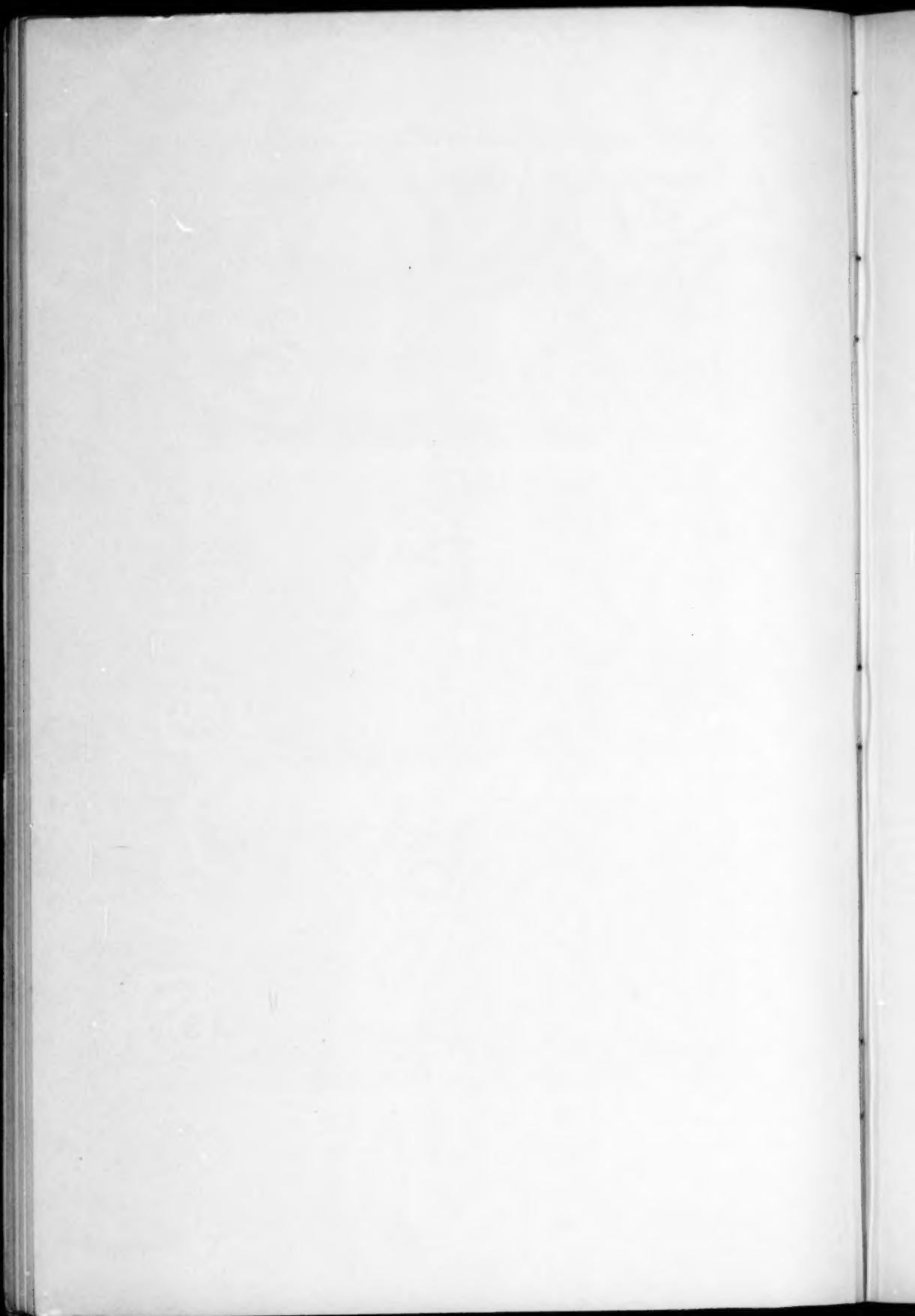
Since the male heron, in order to attract a female into his territory, adopts the gestures of a subordinate bird, the question remains, May not another male occasionally pair with him in exactly the same way that two immature birds forced into the same territory may form a pair provided one subordinates itself? In the field this probably never would happen because there is a superabundance of possible territories and the snapping male while calling often moves from one to another. In the laboratory cages this is a real danger because of the restriction of space. One of the reasons why only four pairs of our white adults bred was that two other pairs which formed, were male-male groups.

The formation of both of these homosexual pairs was observed in detail. Bird R_4 , driven by other adults of the colony, was forced into the territory of B_4 . This latter bird had been engaging in the twig ceremony and when R_4 , a male, entered his territory he lowered his head and overtured in the manner of a subordinate bird (Plate 3, fig. C). Bird R_4 stood a moment in the territory of B_4 but when the latter displayed in exactly the manner he would to a female, R_4 moved away. Only two other pairs had formed in the bird room at this time and there was still great competition for space. Bird R_4 was forced again and again into the territory of B_4 but he never played with the sticks of that bird's nest or even engaged in twig ceremony. After repeated displays B_4 mounted R_4 but the latter immediately flew away. The next attempt was also unsuccessful. The third attempt was initiated by R_4 which had never displayed. B_4 remained in his territory and permitted himself to be trod. The pair was now formed but B_4 was unsatisfied with his nest and accompanied by his male mate flew a few days later to a new group of branches where he began a new nest. The pair remained together and defended their territory against other birds throughout the breeding season. Bird R_4 was observed to tread B_4 twenty-one times and only once did the latter avoid these advances. On the other hand B_4 trod R_4 eleven times and was avoided by the latter five times. It will be noted that B_4 , the original owner of the territory, although displaying, did not succeed in dominating his male mate which mounted him approximately twice as many times as he did the other. Here was a case where two males formed a pair because one was forced into the other's territory. The former male being in a strange territory showed no aggression and the latter male because of its sex drive was forced to adopt a subservient attitude to the newcomer. In time neither succeeded in completely dominating the other, although the newcomer had an advantage over the resident bird.

The second pair of homosexual white males was also formed as a result of crowding. The two birds were holding separate territories until driven to the floor of the bird room by a pair seeking a favorable nesting site. One



ERECTION OF PLUMAGE IN NIGHT HERONS



bird overtured to the other and displayed. This subordination of the overturing bird permitted a further approximation of the couple. A few days later a bond had formed between them and they flew together to a nesting site on the top of our observation blind.

The one pair of homosexual first-year males which formed was not so clearly the result of crowding. Male RB-B was observed to overture and display toward any bird which entered his territory. Almost invariably the newcomer would become frightened and move away. Male RY-Y appeared to be stimulated by this performance and remained to respond with a similar display. Here again there was no territory defense by either bird against the other but strong territory defense against other birds. Soon after the pair had formed they flew to a new territory which they defended against intruders.

INDUCEMENT FOR COPULATION

The three homosexual unions reported above gave further evidence that the male requires no stimulus from the female to attempt copulation. The chief requirement is that the one bird of the pair will for the moment at least take a subservient attitude. We frequently saw normal copulations fail merely because the female lifted her head into the dominant position. Proof that the female is actually subordinate to the male at the time of copulation is shown by the fact that she frequently overtures to him immediately after he dismounts. As shown in the study of the immature bird this is one of the criteria of a subordinate position.

We frequently observed both in the field and in the laboratory, copulations without any preliminary ceremony. In the few cases where there was some introductory behavior this emphasized the fact that the male must regain his dominant position relative to the female before he will mount. In some cases the female may hasten this process by overturing to the male. The following observation made at Great Neck, April 25, will illustrate: "Two birds are standing side by side. The one with three long plumes is attempting to break twigs from a branch. The one with shorter plumes overtures to the other, presumably the male, and attempts to bill. The presumable male at last engages in billing while holding his head higher than does his mate. While billing the apparent female raises her head until it is higher than her mate's. This causes the apparent male to turn away, but his mate gently pushes him with her bill and overtures. A minute later the apparent male mounts mate in typical copulation."

On the other hand if the female is not ready for copulation the act may not be completed even though both partners display. Another observation made at Great Neck the same day as the above will illustrate: "Male bird, to judge from the three long plumes, picks up twigs from incomplete nest

and engages in typical twig ceremony while erecting feathers of lower neck. He displays and apparent female, with two much shorter plumes, responds by erecting feathers of crown and neck. Male continues to build nest and then walks to end of limb to break off a twig. He brings it to her but drops it before reaching her. They stand close together, he mounts but copulation is not effected."

SEXUAL SELECTION IN THE NIGHT HERON

It seemed to us a rather significant fact that the two males of our series of twelve adult males and five adult females that had damaged crowns and broken head plumes, were among the first birds to build nest platforms, and were the most persistent in both twig and snap-hiss ceremonies and yet neither secured mates the entire season. Apparently their unusual appearance caused females to avoid them. This raised the question of the functional significance of plumes. Lorenz was of the opinion that these structures could not be considered ornaments. It may be noted, however, that they are erected primarily during the display. They serve no function in territory defense for they are held flat against the neck at this time. Although these feathers increase in length during the breeding season, their change is not as dramatic as are two other modifications of the breeding adult which have apparently entirely escaped the notice of ornithologists.

In both our first-year herons and in our white adults there was a marked change in the color of the lore and most of the bill at the beginning of the breeding season. In both sexes this turns a dark blue, purplish and finally black (Plate 2, fig. B; Plate 3, fig. F). In our series of first-year birds the females developed blacker lores than the males but in our older birds, while the black was equally intense, the males developed these dark tones earlier and held them longer than did the females. As the lores darken the upper and lower mandibles of the white birds also darken until at the height of the display period the mandibles may be entirely black both inside and out. As the pupils contract and the eyeballs protrude during the display, these dark lores give a sharp color contrast to the red irises. With the onset of incubation they begin to fade until shortly after the eggs hatch they change to a pale greenish or yellowish in first-year breeding birds and to a chalky white in the older adult birds. The second change occurred in the pigmentation of the legs. Hickey (1937), in discussing the variation in leg color of various eastern herons, states that some Long Island Night Herons often have pink legs. Most of our old Night Herons developed pink legs and feet at the height of their courtship. These were distinctly redder in the males of two pairs and equally red in two others. In none of the first-year birds was this color attained although some underwent a slight change in leg color. In the field at Great Neck a check was made of the leg color of

over forty-three adult mated pairs. In thirty-eight both sexes had pink legs, in four the female had yellower legs than the male, in one pair of white birds both sexes had equally yellow legs and one lone male seemed to have yellow legs. Hence, although the laboratory white adults demonstrated a change of leg color during the breeding season, field observations indicated that not all breeding birds attain the full pink color. It may be noted that the tendency for males to attain the full color more often than the female is correlated with the greater use the male makes of his legs during courtship. During the snap-hiss ceremony the limbs are rhythmically lifted and extended as if to catch the eye of a female.

We observed in the laboratory that courtship activity was "contagious" in the sense that the movements of one bird started the others to court. Similarly, the courtship movements of the male when repeated by the female serve to stimulate her. When one bird of a pair of immature herons flies to its territory it gives a greeting call which serves to identify it. The partner responds and they bill. We showed that where the partner could not hear there was toleration but few contacts. Similarly in the adult pairs the greeting identifies the arrival and makes possible further contacts. Paired birds, even after the eggs have been laid, when returning to the nest combine a display with the greeting. Since the male's display is greater than that of the female it serves to keep him in a state of dominance in exactly the same way that a superior head posture functions in the immature. Overturing and billing are much rarer in both first-year and white breeding pairs than in juvenile companion pairs. The fact that both sexes of adult pairs display would seem to indicate, however, that both are sexually stimulated. This Huxley (1921) has called 'mutual courtship.' Carpenter (1933) has showed that the courtship of pigeons may be subdivided into acts requiring different thresholds of provocation. These acts in a definite order "serve to synchronize the degrees of sexual excitation in the two animals of a pair." There is, therefore, some evidence, if only indirect, that a mutual selection such as Huxley postulated may have taken place to foster the genesis of epigamic characters in the Black-crowned Night Heron. Those features, common to both sexes during courtship, include (a) black lores and mandibles, (b) red irises which can be expanded by contraction of the pupils, and (c) white plumes set against a black crown.

Future work may show that other herons undergo the seasonal change of lore color which we have found in the Night Heron. Thus the pairs of Louisiana Heron (*Hydranassa tricolor*) which Huxley (1922) found to have different shades of lore color may not have owed these differences to any selection of bright-lored bird by a similar variant. Rather, these differentially colored pairs were in different stages of the breeding cycle. Possibly the bright lores are attractive but all herons of this species would tend to have them at the height of the courtship season.

GENESIS OF DOMINANCE

The earliest feeding response which we observed among the young herons (fourteen days of age) was an attempt at grasping and stroking of the parent's beak. No system of rotation of either parent's supplying food or of feeding young was noted. The oldest and largest bird in the nest secured the greatest quantity of fish. The parent frequently supplied large pieces of fish, when a tug-of-war resulted with the oldest bird the victor. At about three or four weeks it was observed that the older birds vied for the privilege of stroking the parent's beak. In such instances each bird attempted to keep its head higher. Frequently bills were contacted, opened and shut and the opponent's head pushed back. Later these movements became more precise; the smaller and presumably younger birds assumed a subservient position of the head every time they billed with their older brothers or sisters. In this way the billing behavior between young in a nest seemed to be an outgrowth of the feeding responses of the young.

From approximately five days of age, young herons indicate a form of antagonism by a continuous erection of crown feathers during the presence of the observer. At about ten days of age, the oldest bird in the nest initiates an exaggerated form of this reaction, namely, spread wings, erected crown feathers, and a peck followed by the screech call. Parents, when entering the nest, issue a recognition call accompanied by an erection of crown and neck feathers. Immature herons, approximately nine weeks old, overture to their parents, exchange recognition calls and bill with them. The parents may erect the feathers of crown and upper part of the neck but those of the lower neck never stand out in typical courtship manner.

Young herons approximately nine weeks of age recognize their parents and the latter distinguish their own young from other immatures of the same age. This was well shown by transferring four young of the first-year birds to different nests having young of the same age in the same cage. During a single observation period of six hours there were twenty-seven contacts between the foreign young and resident young. The transferred young, whether in the new nest or within a distance of eight feet of it, billed with resident young until one or more young assumed the subordinate position of the head. There was no attempt to secure territory by the transferred birds and only the resident young gave food calls. Twenty-two contacts between adults and young in this experiment were observed. The adults pecked only the foreign young but this attack was not as vicious as it would have been against strange adults. Parents responded to the recognition calls and food calls of their own young only. Adult pairs continued to exchange recognition calls while erecting crown and upper-neck feathers.

Grouping and interchanging the young of a number of nests did not result in territory-defense reactions between young. It would therefore seem that

the feather erection of young birds is a defense mechanism developed before there is any claiming of territory. The first evidence of territory defense begins when the young leave the nest and climb about in the nesting tree. In brief, defense responses begin in the ontogeny of the Night Heron long before there is any territory defense. Contrary to the views of Schjelderup-Ebbe (1924), a pecking order, that is a dominance hierarchy, may appear in nestlings of the heron, but when territorialism later appears it completely obscures this order in all except paired birds or in grouped individuals from the same nest.

DISCUSSION

Throughout our work we have employed the term "territory" in a broader sense than usually found in the ornithological literature. The term has recently been the subject of critical review (Friedmann, 1935; Tinbergen, 1935; Mayr, 1935; Portielje, 1936; Lack and Lack, 1936). The most comprehensive definition is that given by Tinbergen (1936). He states that territory is "an area which is defended by a fighting bird shortly before and during the formation of a sexual bond."

Breeding male herons defend their immediate vicinity against the encroachment of aggressive birds. But if a non-aggressive male or female enters one's territory, the resident male assumes a subservient attitude and in this way invites the newcomer to stay. A courting male does not lose territory entirely. If a bird guarding a neighboring territory should encroach upon his domain he thrusts his head forward in a vigorous defense reaction indicating that territory-defense behavior is still available for use against aggressive trespassers.

There is no doubt that the territory of the adult Black-crowned Night Heron is identical with that of the immature although it may embrace more area. We have shown that two immature herons, strangers to each other, may form a pair if forced into the same territory while too harassed to exhibit typical defense reactions. Similarly, two adult males may form a pair which will remain faithful to each other throughout an entire breeding season provided they are driven into the same territory at the time one of them, because of its reproductive drive, is forced to adopt a subservient attitude. Territory has, therefore, other functions than usually assumed. It aids the formation of bonds between two birds which are forced to occupy a common area. In Nature the female is attracted to the male by his snap-hiss or twig ceremony. Being in a strange territory, she would not adopt any aggressive attitude toward the male. The latter in his turn is forced by his sexual drive to adopt a subservient attitude. The result is exactly the same as if the birds were forced together in a strange locality where neither would develop a defense response.

Once a bond has been formed, the pair may leave the territory together and build a nest in a new locality. We noted both in the laboratory and in the field that such pairs easily drove resident birds from the territories they had been defending. The display of the heron has no rôle in territory defense. In other birds it has been assumed to make the male dominant to the female in order that copulation may proceed (Portielje, 1936). Our detailed observations indicate that it has this important function in the heron as well, even though the response of the female may also serve to stimulate the male. Since males giving the snap-hiss ceremony may have no nest platform in their immediate vicinity, it is obvious that nests do not play as important a rôle in the formation of pairs of Night Herons as they do in some other birds, such as the Grey Heron described by Verwey (1930).

It is highly probable that other species of Ardeidae will be found to have a social system very similar to that of *Nycticorax*. Many features of the behavior of American Ardeidae given by Bent (1926) indicate that the courtships of the different species have much in common. Nevertheless, the life history of no other American species is known in sufficient detail for a close comparison with the behavior of *Nycticorax* as described above. It is necessary to turn to Verwey's description (1930) of the European Grey Heron for these details. Verwey describes both young and old *Ardea cinerea* as directing vicious thrusts toward others of their own kind and his description (p. 15) of this behavior in the field indicates that *A. cinerea* makes the same territory claims as does the Night Heron in freedom. He states that as soon as the young Grey Herons begin to fly they develop a greeting cry which suggests that individuals within the family group recognize one another as in the case of the Night Heron. No attempt was made by Verwey to identify bonds between the young herons but the description of Holstein (1927), as quoted by Verwey, indicates that there is an even more severe competition between the young Grey Herons of the same nest than among nest mates of Night Herons. Nevertheless, Verwey raises the question as to the functional significance of this struggle. It would seem certain from Beetham's (1910) account of the struggle among nestlings of *Ardea purpurea* that age and superior billing ability aid in securing food from the parent. The same struggle was seen by us in young Black-crowned Night Herons and was shown to give rise to the specific dominance reaction which we call billing.

Lorenz (1934) found that young *Nycticorax n. nycticorax* are recognized, fed and protected by their parents outside of the nest. We have observed no feeding of young outside of the nest area in our American race. Nevertheless, parents distinguish their young from other young and the latter can distinguish their parents from other adults. In the Grey Heron adults may feed strange young as well as their own, indicating that there is less recognition of young than in the case of the Night Herons.

The Grey Heron exhibits certain movements not found in the Night Heron but otherwise the courtship behavior of the two species has much in common. The male Grey Heron attracts the female by a modified flight call and not by a snap-hiss ceremony described above. There is no typical twig ceremony in the Grey Heron although the bill clicking practiced by the male only might be considered a twig ceremony without twigs. The neck of the mate is stretched forward and slightly downward, not upward as in the typical twig ceremony of the Night Heron. De Waard (1936) claims that the female may occasionally posture and click the bill in the manner of the male. If this is true, the bill clicking may be merely an overture movement practiced in the Grey Heron primarily by the male.

The stretch movement of the Grey Heron seems to correspond to the overture and display of the Night Heron modified by a vertical posturing of the neck. As in the case of the Night Heron's display, this is at first practiced by the male only but later by both sexes. If our interpretation of this movement is correct, it would serve the double function of securing dominance for the male and stimulating the female to sexual activity. When adult Grey Herons are paired they exchange greeting calls. Verwey found that the young Grey Herons failed to retain this call after the young left the vicinity of the nest. Our captive birds, being kept in close contact throughout the winter, retained their greeting call and we were able to show how this call together with the overture was taken over into the pattern of the adult.

The Grey Heron has one call that has no analogue in the Night Heron. After an unsuccessful copulation the female Grey Heron utters a distinctive cry, according to Verwey. The female Night Heron either remains silent or overtures. The overturing tends to facilitate the second attempt because it places the female in a subservient position to her partner.

No evidence has been found in our studies of the existence of a 'releaser' such as Lorenz (1935) described, that is, of an "organ of a peace-making ceremony without any sexual meaning" (Lorenz, 1937). The plumes are held in an inconspicuous position during the defense response and also during overtures. Steinfatt (1934) describes these plumes as being erected during the attack of the closely related *Nycticorax n. nycticorax*. This occurs in the American race only when an attack closely follows a display. Only during the breeding season when the display is combined with the overtures are the plumes erected at the same time that the heron bows low. In the Yellow-crowned Night Heron (*Nyctanassa violacea*) Nice (1929) describes a case of nest relief with erection of plumes. In the Black-crowned Night Heron such a relief is usually accompanied by recognition calls and the plume display, if it occurs, is part of the courtship. That this display is stimulating, is an inference based on the fact that a heron usually responds

to the display of its mate and also on the fact that early in the season before there has been much display the female Black-crowned Night Heron will not allow the male to mount. Two of our males with damaged crowns and plumes failed to secure mates although they courted for long periods in the presence of unmated females. As we have shown above, the erection of the crown feathers takes place in a wide variety of social situations while the erection of the plumes occurs only as part of the courtship display. Whether the failure of these birds to secure mates was due to their short plumes or the unusual appearance of the crowns cannot be stated. We have shown in the young herons that pairs form before plumes develop but these pairs are not sexually active. The fact that males of sexually mature pairs usually show longer plumes than the females is correlated with the fact that the male must secure dominance over the female before copulation may proceed and, in the process of securing this dominance, the male displays more extensively than the female.

CONCLUSIONS

1. The struggle for food among the nestlings of the Black-crowned Night Heron leads to a hierarchy of dominance which is maintained in older nestlings by billing reactions toward one another.

2. As flight develops young Night Herons claim territories which they defend against other herons. Territorial requirements tend to break up the groups of nestlings and a struggle for dominance in any one territory tends further to disintegrate the group but where dominance relations are well established immature pairs may remain together for months defending common territory even in new cages.

3. The new territorial requirements completely mask the dominance hierarchy among birds maintained in large cages except in the case of pairs or nestling groups. Crowding the birds into a single strange territory causes the reappearance of the dominance hierarchy.

4. Territorialism may similarly prevent the functioning of a pecking order in pigeons.

5. Members of pairs of immature herons may recognize each other after a separation of twenty days. Details of voice and feathering serve as cues in this recognition. Separation of members of a pair for only six days is followed by failure to recognize if the color pattern of the head has been modified by artificial refeathering.

6. Plugging the ears prevents a synchronization of greeting ceremonies, indicating that sound is more important than movement in calling forth these responses.

7. New pairs of immature birds may be formed by crowding two individuals for short periods in a common territory provided one bird accepts a

subservient position to the other. Homosexual male pairs may be formed during the breeding season by the same method. These pairs remain stable in new territory.

8. The normal formation of heterosexual pairs in breeding birds differs from that of the immature. The male attracts the female into his territory by his snap-hiss and twig ceremonies. At the same time the male assumes a subservient attitude toward birds of either sex entering his territory although he still attacks neighboring males which encroach in a belligerent manner upon his territory.

9. Adult pairs practice the greeting ceremony of immature pairs but during the courtship period display while making the gesture. This display differs from the feather erection of other social situations in that in addition to raising the feathers of crown and upper neck those of the lower neck are also spread while the long crown plumes are erected. At the same time the pupils contract, eyes bulge and mouth frequently gapes. The greeting call of the courting male also becomes more guttural than that of the female.

10. The plumes of the crown are only erected during the courtship display and have no function in territory defense or in pacifying approaching individuals as previously reported. Since the display of the male induces the female to gesture in the same manner, the performance is presumably stimulating to the latter.

11. The plumes of the male are usually longer than those of his mate. Two males with damaged plumes failed to secure mates, suggesting that females will not pair with males of unusual appearance.

12. The display and billing ceremonies of the male Night Heron tend to return him to a state of dominance in order that copulation may occur.

13. There is a seasonal change in color of lores, mandibles and legs of the Black-crowned Night Heron. The lores and bill of the courting bird tend to become bluish black, the legs pink. In some breeding birds of the first year the mandibles may not attain this color and the legs very rarely undergo the complete change. Females usually lag behind the males in plumage growth and often in leg reddening.

14. The tendency for the males to have pinker legs is correlated with a greater display of their legs during the courtship ceremonies. Greater plumage length is correlated with the necessity of males securing dominance over their mates before copulation may proceed. Mutual selection may have aided the genesis of striking color contrasts of plumes, eyes and lores because the ceremonies of overture and display are mutual. Nevertheless, there are sexual differences in this display which eventually lead to the male securing the necessary dominance.

REFERENCES

- ALLEE, W. C.
 1936. Analytical studies of group behavior in birds. *Wilson Bull.*, **48**: 145-151.
- BEETHAM, B.
 1910. *The home-life of the Spoonbill, the Stork and some herons.* London.
- BENT, A. C.
 1926. Life histories of North American marsh birds. *Bull. U. S. Nat. Mus.*, no. 135: 197-213.
- CARPENTER, C. R.
 1933. Psychobiological studies of social behavior in Aves. *Journ. Comp. Psychol.*, **16**: 25-98.
- CRAIG, W.
 1908. The voices of pigeons regarded as a means of social control. *Amer. Journ. Sociol.*, **14**: 86-100.
- DE WAARD, S.
 1936. Blauwe Reiger. *De Levende Natuur*, **41**: 159-160.
- FRIEDMANN, H.
 1935. Bird societies, in: Murchison, C., 1935, *A handbook of social psychology*, Worcester, Mass., Clark Univ. Press, Chap. 5.
- GROSS, A. O.
 1923. The Black-crowned Night Heron (*Nycticorax nycticorax naevius*) of Sandy Neck. *Auk*, **40**: 1-30; 191-214.
- HICKEY, J. J.
 1937. Notes on leg colors of white herons. *Condor*, **39**: 131.
- HOLSTEIN, V.
 1927. Fiskehejren. Kopenhagen.
- HUXLEY, J. S.
 1921. The accessory nature of many structures and habits associated with courtship. *Nature*, **108**: 565-566.
 1922. Preferential mating in birds with similar coloration in both sexes. *British Birds*, **18**: 99-101.
- LACK, D., AND LACK, H. L.
 1936. Territory. Some recent American work. *British Birds*, **29**: 255-258.
- LORENZ, K.
 1934. Beobachtungen an freifliegend zahmgehaltenen Nachtreihern. *Journ. f. Ornithol.*, **82**: 160-161.
 1935. Der Kumpan in der Umwelt des Vogels. *Journ. f. Ornithol.*, **83**: 137-213; 289-413.
 1937. The companion in the bird's world. *Auk*, **54**: 245-273.
- MASURE, R. H., AND ALLEE, W. C.
 1934. The social order in flocks of the common chicken and the pigeon. *Auk*, **51**: 306-327.
- MAYR, E.
 1935. Bernard Altum and the territory theory. *Proc. Linn. Soc. New York*, 1933-34, nos. 45, 46: 24-38.
- MURCHISON, C.
 1935. The experimental measurement of a social hierarchy in *Gallus domesticus*. I. The direct identification and direct measurement of social reflex No. 1 and social reflex No. 2. *Journ. Genet. Psychol.*, **12**: 3-39.
 II. The identification and inferential measurement of social reflex No. 1,

and social reflex No. 2 by means of social discrimination. *Journ. Soc. Psychol.*, **6**: 3-30.

III. The direct and inferential measurement of social reflex No. 3. *Journ. Genet. Psychol.*, **46**: 76-102.

NICE, M. M.

1929. Some observations on the nesting of a pair of Yellow-crowned Night Herons. *Auk*, **46**: 170-176.

PORTIELJE, A. F. J.

1936. Ein bemerkenswerter Grenzfall von Polygamie bzw. accessorischer Promiskuität beim Höckerschwan, zugleich ein Beitrag zur Ethologie bzw. Psychologie von *Cygnus olor* (Gm.). *Journ. f. Ornithol.*, **84**: 140-158.

SCHJELDERUP-EBBE, T.

1924. Zur Sozialpsychologie der Vögel. *Zeitschr. f. Psychol.*, I Abt., **95**: 36-84.

1931. Die Despotie im sozialen Leben der Vögel. *Forsch. Völkerpsych. Soziol.*, **10**: 77-137.

STEINFATT, O.

1934. Ein Beitrag zur Kenntnis der Naturgeschichte, insbesondere des Brutlebens des Nachtreihers, *Nycticorax n. nycticorax*. *Beitr. z. Fortpflanzungsbiol. Vögel*, **10**: 85-96.

TAYLOR, W. S.

1932. The gregariousness of pigeons. *Journ. Comp. Psychol.*, **13**: 127-131.

TINBERGEN, N.

1935. Over de Betekenis van "Territorium" in het Leven der Vogels. *Vakblad v. Biol.*, **16**: 95-106.

1936. The function of sexual fighting in birds; and the problem of the origin of "Territory." *Bird-banding*, **7**: 1-8.

VERWEY, J.

1930. Die Paarungsbiologie des Fischreiher. *Zool. Jahrb. (Allg. Zool. u. Physiol.)*, **48**: 1-120.

EXPLANATION OF PLATES

PLATE 2

Young Black-crowned Night Herons

Fig. A. Immature, approximately four months old, showing pale-greenish lore, upper bill black shading to olive and lower bill olive.

Fig. B. Sexually mature Night Heron, approximately thirteen months old, showing dark lore, bright black beak and well-developed plumes. Both the brown and the white adults undergo a seasonal color change of lores and beaks.

Fig. C. Same bird as in Fig. A, same age, showing arrangement of its own breast feathers which were attached with rubber cement to crown and side of face for recognition tests.

PLATE 3

Eight stages in the sexual behavior of Black-crowned Night Herons

Fig. A. Territory defense. The bird on the right with damaged crown and plumes failed to secure a mate the entire breeding season.

Fig. B. Twig ceremony. Although the female will fondle sticks, only the male lifts his head vertically upward and clicks stick loudly. Many sticks employed in this ceremony are dropped but some are built into the nest.

Fig. C. Male overtures. If the female remains in his vicinity the male (left) lowers his head and brings cheek parallel to nest while giving a guttural greeting call not heard outside of the breeding season. At the same time he may fan his lower neck feathers as shown here.

Fig. D. Male displays. Erecting his crown feathers and plumes, raising his saddle feathers and puffing up all the feathers of his neck, the male (right) repeats his guttural greeting while bowing to the female. At the same time his pupils contract exposing the red irises to the maximum and the eyeballs protrude slightly from the head.

Fig. E. Attempt to regain dominance. The male, while continuing to ruffle the feathers of neck and back, raises his head toward the level of the female's head.

Fig. F. Billing for dominance. The male to be dominant must bill with head higher than that of the female. While fencing for this position, the male continues to display.

Fig. G. Display following success at securing dominance. Both sexes display in exactly the same way. The plumes of male (right) are longer and neck feathers are fanned more extensively (compare Figs. F, E, D; Plate 4, fig. B).

Fig. H. Copulation. The male (above) balances himself on the humeri of the female, his bill touches her crown and his tail is brought down and turned sideways.

PLATE 4

The plumes of the Black-crowned Night Heron are erected only during courtship. In other social situations other feathers may be raised.

Fig. A. Plumage in territory defense. The bodies are held low while some of the feathers on crown, neck and saddle are erected. The plumes are laid flat against the back and fail to show while the birds exchange pecks.

Fig. B. Plumage in courtship. Male (left) erects his three plumes, while raising feathers of neck and saddle. The female (right) responds with erected crown feathers and single plume. Her pupils contract and eyes bulge.

Fig. C. Plumage in dominance reaction. Male (left) holds his head in the superior position when billing with the female, his mate. At the same time he puffs slightly the feathers of head and neck but fails to erect the plumes. Male on the right is standing on extreme left of his territory, while bird in foreground with damaged crown and broken plumes maintains the territory he occupied alone throughout the season.

The American Museum of Natural History
New York City

ADDITIONAL HOSTS OF THE PARASITIC COWBIRDS¹

BY HERBERT FRIEDMANN

In several earlier publications ('The Cowbirds,' 1929; Auk, 1936, pp. 52-65; Condor, 1933, pp. 189-191; Ibis, 1934, pp. 340-347; Wilson Bulletin, 1934, pp. 25-36, 104-114) I have compiled all that was known to me of the species of birds acting as hosts of the various species of cowbirds. Since the last of these, I have gathered considerable additional information, based partly on unpublished specimens in private collections and partly on data gleaned from recent publications. For information generously sent me, I am under great obligation to Mr. G. D. Smooker of St. Joseph, Trinidad, Señor José Caetano Sobrinho of Arcos, Minas Geraes, Brazil, Dr. L. E. Hicks of Ohio, Dr. Paul Harrington of Toronto, and Mr. T. E. Randall of Alberta.

MOLOTHRUS BONARIENSIS (Gmelin). Shiny Cowbird

To the 137 species and subspecies of birds previously listed as victims of the various races of the Shiny Cowbird, we may now add 21 others, bringing the total up to 158. The additions are as follows:

Certhiaxis cinnamomea cinnamomea (Gmelin). YELLOW-THROATED SPINE-TAIL.
Phacellodomus striaticollis striaticollis (Lafresnaye and d'Orbigny). RUFOUS-HEADED THORN-BIRD.

Anumbius anumbi (Vieillot). LEÑATERO.

Elaenia flavogaster flavogaster (Thunberg). YELLOW-VENTED CRESTED FLYCATCHER.

Mimus saturninus frater Hellmayr. BRAZILIAN MOCKINGBIRD.

Mimus gilvus tobagensis Delmas. TOBAGO GRACEFUL MOCKINGBIRD.

Turdus chiguanco anthracinus Burmeister. SOOTY THRUSH.

Hylophilus aurantiifrons saturatus (Hellmayr). EASTERN OCHRE-FRONTED WOOD-BIRD.

Ateleodacnis bicolor bicolor (Vieillot). BICOLORED ATELEODACNIS.

Thraupis episcopus sclateri (Berlepsch). TRINIDAD TANAGER.

Tachyphonus rufus (Boddaert). GREATER WHITE-SHOULDERED TANAGER.

Ramphocelus carbo magnirostris Lafresnaye. LARGE-BILLED TANAGER.

Saltator similis d'Orbigny and Lafresnaye. ALLIED SALTATOR.

Oryzoborus crassirostris (Gmelin). THICK-BILLED SEED FINCH.

Myospiza humeralis humeralis (Bosc). GRASSHOPPER FINCH.

Poospiza assimilis Cabanis. GRAY-THROATED WARBLING FINCH.

Coccopsis nigrigenis (Lafresnaye). BLACK-FACED CARDINAL.

Leistes militaris supercilialis (Bonaparte). ARGENTINE RED-BREASTED MARSH-BIRD.

Pseudoleistes guirahuro (Vieillot). YELLOW-BACKED MARSH-BIRD.

Icterus nigrogularis trinitatis (Hartert). TRINIDAD ORIOLE.

Holquiscalus lugubris lugubris (Swainson). BOAT-TAILED GRACKLE.

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These hosts involve three races of the Shiny Cowbird, as follows:

1. *MOLOTHRUS BONARIENSIS BONARIENSIS* (Gmelin). Argentine Shiny Cowbird

Phacellodomus striaticollis striaticollis (Lafresnaye and d'Orbigny).

Anumbius anumbi (Vieillot).

Turdus chiguanco anthracinus Burmeister.

The known hosts of this race of the parasite now total 113 forms.

2. *MOLOTHRUS BONARIENSIS MELANOGYNA* Stolzeman. Dark Shiny Cowbird

Mimus saturninus frater Hellmayr.

Turdus rufiventris rufiventris Vieillot.

Saltator similis d'Orbigny and Lafresnaye.

Myospiza humeralis humeralis (Bosc).

Poospiza assimilis Cabanis.

Emberizoides herbicola (Vieillot).

Sicalis pelzelni (Selater).

Gnorimopsar chopi (Vieillot).

Pseudoleistes guirahuro (Vieillot).

These nine bring the known victims of the Dark Shiny Cowbird up to eleven forms.

3. *MOLOTHRUS BONARIENSIS MINIMUS* Dalmas. Small Shiny Cowbird

Certhiaxis cinnamomea cinnamomea (Gmelin).

Elaenia flavogaster flavogaster (Thunberg).

Mimus gilvus tobagensis Dalmas.

Hylophilus aurantifrons saturatus (Hellmayr).

Ateleodactylus bicolor bicolor (Vieillot).

Thraupis episcopus sclateri (Berlepsch).

Tachyphonus rufus (Boddaert).

Ramphocelus carbo magnirostris Lafresnaye.

Oryzoborus crassirostris (Gmelin).

Coccyzus nigrigenis (Lafresnaye).

Icterus nigrogularis trinitatis (Hartert).

Holquiscala lugubris lugubris (Swainson).

The list of hosts of this cowbird is hereby raised to a total of twenty-four forms.

In the following annotated list, not only are all of the above listed forms taken up in greater detail, but also a few others, about which relatively important additional data have come to hand, are briefly treated.

Certhiaxis cinnamomea cinnamomea (Gmelin).—One record; a nest with four eggs of the Yellow-throated Spine-tail and one of the Small Shiny Cowbird, collected in the Caroni Marshes, Trinidad, July 18, 1930, by Mr. G. D. Smooker, to whom I am indebted for this and most of the other Trinidad cases mentioned in this paper.

Phacellodomus striaticollis striaticollis (d'Orbigny and Lafresnaye).—Pereyra (El Hornero, 5: 215-219, 1933) records a nest of the Rufous-headed Thorn-bird containing four of its own eggs and three of the Shiny

Cowbird, from Argentina, now in the National Museum in Buenos Aires. The nest has a tube-like vestibule leading to the nest chamber; the cowbirds' eggs were in the tube and not in the chamber where the thorn-birds' were.

Anumbius anumbi (Vieillot).—One published record has come to my notice. Castellanos (El Hornero, 5: 332, 1934) found young of the Shiny Cowbird in a nest or nests of this species in the Valle de Los Reartes, Cordoba, Argentina.

Pitangus sulphuratus bolivianus (Lafresnaye).—According to Castellanos (El Hornero, 5: 332, 1934) this large flycatcher is parasitized by the Shiny Cowbird in the Province of Cordoba (Valle de los Reartes), Argentina. Previous records were from Tucuman and Mendoza.

Elaenia flavogaster flavogaster (Thunberg).—Belcher and Smooker (Ibis, 527, 1937) have found the Yellow-vented Crested Flycatcher to be a molothrine victim in Trinidad.

Phaeoprogne tapera (Linnaeus).—In the Valle de los Reartes, Cordoba, Argentina, Castellanos (El Hornero, 5: 332, 1934) found the Tree Martin to be victimized by the Shiny Cowbird. This is the second such instance known to me, the first being Gibson's record from Ajo, southern Buenos Aires (cf. 'The Cowbirds,' 106-107, 1929).

Mimus saturninus frater Hellmayr.—Señor Sobrinho informs me that in Minas Geraes, Brazil, this mockingbird is victimized by the Dark Shiny Cowbird.

Mimus gilvus tobagensis Dalmas.—Listed as a victim of the Small Shiny Cowbird in Trinidad by Belcher and Smooker (Ibis, 527, 1937).

Mimus patagonicus (Lafresnaye and d'Orbigny).—To the two previous records may be added a third, a nest containing a nearly fledged Shiny Cowbird, found by Renard near the naval base at Puerto Belgrano, Argentina (El Hornero, 5: 219, 1933).

Turdus rufiventris rufiventris Vieillot.—The Rufous-bellied Thrush has been known as a molothrine host in Argentina and Uruguay. We learn from Sobrinho that it acts in this capacity in Brazil (Minas Geraes) as well for the Dark Shiny Cowbird.

Turdus chiguanco anthracinus Burmeister.—One record. Castellanos (El Hornero, 5: 332, 1934) found a parasitized nest in Valle de los Reartes, Cordoba, Argentina.

Turdus amaurochalinus (Cabanis).—Previously known as a molothrine victim in Tucuman Province, Argentina, it is now recorded in the same capacity farther to the south,—at Valle de los Reartes, Cordoba Province, by Castellanos (El Hornero, 5: 310, 1934).

Vireosylva chivi chivi (Vieillot).—The Chivi Vireo was previously known as a victim of the Shiny Cowbird on the basis of three records. To these may be added a fourth,—a nest with no eggs of the vireo and two of *M. b.*

bonariensis, recorded by Pereyra (El Hornero, 5: 218, 1933) from San Isidro, Argentina.

Hylophilus aurantiifrons saturatus (Hellmayr).—Two records, the data for both sent to me by G. B. Smooker who found the nests at Nelson's Estate, Trinidad, July 19 and 22, 1933. Each nest contained two eggs of the owner and two of the Small Shiny Cowbird.

Ateleodacnis bicolor bicolor (Vieillot).—Smooker writes me that he found a nest of this bird in the Caroni Swamp, Trinidad, July 18, 1932, containing two eggs of the Small Shiny Cowbird and none of the *Ateleodacnis*.

Thraupis episcopus sclateri (Berlepsch).—One record; a nest with two eggs of the Trinidad Tanager and one of the Small Shiny Cowbird, St. Joseph, Trinidad, May 18, 1933, G. D. Smooker.

Ramphocelus carbo magnirostris Lafresnaye.—One record, Trinidad, G. D. Smooker (Ibis, 536-537, 1937).

Piranga flava saira (Spix).—According to Sobrinho (*in litt.*) this tanager is victimized by the Shiny Cowbird in Minas Geraes, Brazil. Previously recorded from there by Skinner, possibly on the same original basis.

Tachyphonus rufus (Boddaert).—One record,—a nest with three eggs of this White-shouldered Tanager, containing three eggs of the owner and one of the Small Shiny Cowbird, Nelson's Estate, Trinidad, August 4, 1930, G. D. Smooker.

Saltator similis d'Orbigny and Lafresnaye.—Señor Sobrinho informs me that in Minas Geraes, Brazil, this saltator is victimized by the Shiny Cowbird.

Oryzoborus crassirostris (Gmelin).—Belcher and Smooker list this seed finch as a molothrine host in Trinidad (Ibis, 527, 1937).

Sicalis pelzelni (Sclater).—Previously known as a host of the Shiny Cowbird in Uruguay and Argentina, it may now be recorded as such in the province of Minas Geraes, Brazil, as well, from information received from Señor Sobrinho.

Sicalis flaveola holti Miller.—Holt's Saffron Finch is listed as a victim of the Shiny Cowbird in Minas Geraes, Brazil, by Sobrinho (*in litt.*). This is the second record known to me.

Myiospiza humeralis humeralis (Bosc).—The Grasshopper Finch is reported by Sobrinho as a host of the Shiny Cowbird in Minas Geraes, Brazil. Previously two other races of this finch (*tucumanensis* and *dorsalis*) were known to be parasitized.

Poospiza assimilis Cabanis.—The Gray-throated Warbling Finch is reported to be a host of *M. b. bonariensis* in Minas Geraes, Brazil, by Sobrinho (*in litt.*). Pereyra (El Hornero, 5: 218, 1933) reports finding two Shiny Cowbird's eggs in a nest of "*Poospiza lateralis* or *cabanisi*" in Isla del Arroya Correa, Argentina, January 15, 1933. This indefinite record may also refer to *Poospiza assimilis*.

Emberizoides herbicola (Vieillot).—Azara's Ground Finch is reported by Sobrinho (*in litt.*) as a host of *M. b. melanogyna* in Minas Geraes, Brazil.

Pitylus fuliginosus (Daudin).—Señor Sobrinho informs me that he has found the Gray Kernel-eater to be victimized by the Dark Shiny Cowbird in Minas Geraes, Brazil. This constitutes the second record for this bird, unless the only previous one,—also from Minas Geraes (Skinner, Ool. Record, p. 20, 1924; Friedmann, Auk, p. 57, 1931),—came originally from the same source.

Coccopsis nigrigenis (Lafresnaye).—The Black-headed Cardinal may be added to the list of victims of the Small Shiny Cowbird (*M. b. minimus*) on the basis of a nest with two eggs of the owner and one of the parasite, found in the Caroni Swamp, Trinidad, September 21, 1931, by G. D. Smooker.

Cnorimopsar chopi (Vieillot).—Previously known as a molothrine host only on the statement in Azara that his assistant, Nosedá, found this grackle to be parasitized. A recent observation of the same import is sent me by Señor Sobrinho from Minas Geraes, Brazil.

Leistes militaris superciliaris (Bonaparte).—Two records,—Pereyra (El Hornero, 5: 219, 1933) records two parasitized nests, one with one egg of the Red-breasted Marsh-bird and nineteen of the Shiny Cowbird, and the other with two eggs of the former and twelve of the latter. No exact locality is given, but it is somewhere in Argentina.

Pseudolcistes guirahuro (Vieillot).—Recorded as a host of the Shiny Cowbird in Minas Geraes, Brazil, by Sobrinho.

Icterus pyrrhopterus pyrrhopterus (Vieillot).—To the single previous record from southern Minas Geraes, may be added the mere statement that Sobrinho also found the Chestnut-shouldered Oriole to be parasitized there by the Shiny Cowbird.

Icterus nigrogularis trinitatis Hartert.—Listed as a host of the Small Shiny Cowbird in Trinidad by Belcher and Smooker (Ibis, 527, 1937).

Holquiscalus lugubris lugubris (Swainson).—In Trinidad, Belcher and Smooker have found eggs of the Small Shiny Cowbird in nests of this grackle.

MOLOTHRUS ATER (Boddaert). North American Cowbird

The following are additions to the list of known victims of the North American Cowbird (all races). They bring the total of host species and subspecies up to 246, an increase of eight.

Empidonax difficilis difficilis Baird. WESTERN FLYCATCHER.

Penthestes carolinensis carolinensis (Audubon). CAROLINA CHICKADEE.

Sialia currucoides (Bechstein). MOUNTAIN BLUEBIRD.

Wilsonia pusilla pusilla (Wilson). WILSON'S WARBLER.

Agelaius phoeniceus nevadensis Grinnell. NEVADA RED-WING.

Loxia curvirostra pusilla Gloger. RED CROSSBILL.

Passerherbulus henslowi henslowi (Audubon). WESTERN HENSLow's SPARROW.
Melospiza melodia heermanni Baird. HEERMANN'S SONG SPARROW.

In addition to these, a few forms, previously listed as victims of one race of the cowbird, have since been found to be parasitized by another race as well. Therefore, if we list the victims according to the subspecies of the cowbird, we have the following additions (including the eight mentioned above).

MOLOTHRUS ATER ATER (Boddaert). Eastern Cowbird

Pentstemon carolinensis carolinensis (Audubon).
Sturnella neglecta Audubon.
Loxia curvirostra pusilla Gloger.
Passerherbulus henslowi henslowi (Audubon).

The known hosts of the Eastern Cowbird now total 145 forms.

MOLOTHRUS ATER ARTEMISIAE Grinnell. Nevada Cowbird

Sialia currucoides (Bechstein).
Vireo solitarius solitarius (Wilson).
Dendroica coronata (Linnaeus).
Wilsonia pusilla pusilla (Wilson).
Agelaius phoeniceus nevadensis Grinnell.
Pipilo erythrophthalmus erythrophthalmus (Linnaeus).

The Nevada Cowbird's list of victims is hereby increased to 87 forms.

MOLOTHRUS ATER OBSCURUS (Gmelin). Dwarf Cowbird

Empidonax difficilis difficilis Baird.
Melospiza melodia heermanni Baird.

We now know 89 hosts for this southwestern form of the Cowbird.

Zenaidura macroura carolinensis (Linnaeus). EASTERN MOURNING DOVE.—To the very few data on the Mourning Dove as a molothrine victim may be added a parasitized nest in Franklin Co., Ohio, found by L. E. Hicks, to whom I am indebted for this information (see also Auk, 51: 386, 1934).

Tyrannus tyrannus (Linnaeus). KINGBIRD.—Coues (Bull. U. S. Geol. & Geogr. Surv., 4, no. 3: 601, 1878) collected a cowbird's egg from a nest of this species near Frenchman's River, Montana, July 9, 1874. This record, which I had previously overlooked, is the second record for the Nevada Cowbird.

Myiarchus crinitus boreus Bangs. NORTHERN CRESTED FLYCATCHER.—A third record has come to my notice. Blocker (Oologist, 54: 131-133, 1936) lists this bird as a victim of the Cowbird near Amboy, Illinois. The two cases previously known to me were in Massachusetts and Maryland.

Empidonax difficilis difficilis Baird. WESTERN FLYCATCHER.—Benson and Russell (Condor, 36: 219, 1934) captured a young Dwarf Cowbird attended by a Western Flycatcher at Berkeley, California. This is the first record of this flycatcher as a molothrine host.

Nuttallornis mesoleucus (Lichtenstein). OLIVE-SIDED FLYCATCHER.—T. E. Randall informs me that he found a nest with three eggs of the flycatcher and one of the Nevada Cowbird at Boyle, Alberta, on June 7, 1934. This is the second record known to me.

Hirundo erythrogaster Boddaert. BARN SWALLOW.—At Colony, Kansas, Wells (Oologist, 51: 13, 1934) found several parasitized nests of the Barn Swallow. Only two such instances were known to me previously.

Cyanocitta cristata cristata (Linnaeus). NORTHERN BLUE JAY.—Previously known as a molothrine victim on the basis of two indefinite records. Blocher (Oologist, 50: 58, 1933, and 54: 131-133, 1936) found the Blue Jay to be parasitized at Amboy, Illinois; a nest containing four eggs of the jay and one of the parasite were definitely reported by him. The second of his notes gives the impression of still another such instance in the same locality.

Penthestes atricapillus atricapillus (Linnaeus). BLACK-CAPPED CHICKADEE.—Blocher (Oologist, 53: 131-133, 1936) lists this bird as a host of the Cowbird at Amboy, Illinois. It is the second case of which I have learned.

Penthestes carolinensis carolinensis (Audubon). CAROLINA CHICKADEE.—One record, a nest containing five eggs of the chickadee and two of the Cowbird, collected at Piney Point, St. Mary's County, Maryland, April 25, 1934, by E. J. Court, who tells me that he caught the female Cowbird on the nest, about half an hour after daylight.

Baeolophus bicolor (Linnaeus). TUFTED TITMOUSE.—To the four cases recorded in earlier papers, I may add another,—a nest with seven eggs of the host and one of the parasite, found at Sherwood, Ohio, May 14, 1934, by Price (Oologist, 51: 107-108, 1934).

Troglodytes aëdon parkmani Audubon. WESTERN HOUSE WREN.—Previously known as a molothrine victim in a single case, we may now add a second record kindly sent me by T. E. Randall, who found a nest with five eggs of the wren and one of the Nevada Cowbird, at Boyle, Alberta, June 10, 1934.

Sialia currucoides (Bechstein). MOUNTAIN BLUEBIRD.—One record, kindly supplied me by T. E. Randall, of a nest found by him at Boyle, Alberta, May 29, 1934, containing four eggs of the bluebird and one of the Nevada Cowbird.

Poliophtila melanura californica Brewster. BLACK-TAILED GNATCATCHER.—A fourth record is given by Hanna (Condor, 36: 89, 1934), a nest found at Riverside, California, in May, 1933.

Sturnus vulgaris vulgaris Linnaeus. STARLING.—Previously known to be

victimized but once, in Maryland, we now have a second record,—Blocher (Oologist, 50: 157, 1933) reports a parasitized nest at Amboy, Illinois.

Vireo solitarius solitarius (Wilson). BLUE-HEADED VIREO.—This bird was known to be a victim of the Eastern Cowbird; we now know it in the same capacity for the Nevada Cowbird on the basis of a parasitized nest found by T. E. Randall at Boyle, Alberta, on May 28, 1934.

Vireo solitarius cassini Xantus. CASSIN'S VIREO.—Michael (Condor, 37: 178, 1935) found a parasitized nest in Yosemite, California. This is the second record known to me.

Dendroica coronata (Linnaeus). MYRTLE WARBLER.—Previously I knew of but three cases of molothrine molestation in this warbler, and a search of the literature certainly gave the impression that the Cowbird only rarely affected the Myrtle Warbler. However, Dr. Paul Harrington writes me that out of thirty-eight nests of this species examined near Wasaga Beach, South Georgian Bay, Ontario, not less than twenty-five contained eggs of the Cowbird; twenty nests had one Cowbird egg; three had two each, and two had three each. One nest had a Cowbird's egg imbedded in its side.

T. E. Randall informs me that he found a nest with four eggs of the warbler and one of the Nevada Cowbird at Boyle, Alberta, May 27, 1934. This is the first record for the Nevada Cowbird.

Dendroica virens virens (Gmelin). BLACK-THROATED GREEN WARBLER.—To the few previous records may be added two more, both from near Wasaga Beach, South Georgian Bay, Ontario, found by Dr. Paul Harrington.

Dendroica pinus pinus (Wilson). NORTHERN PINE WARBLER.—To the four records previously known to me, may be added three more, all from Ontario (Wasaga Beach and Petawawa Military Camp on the Ottawa River), collected by Dr. Paul Harrington.

Oporornis philadelphia (Wilson). MOURNING WARBLER.—A fourth record has come to my attention. Dr. Paul Harrington writes me that he found a nest of this bird, with two eggs of the owner and one of the Cowbird, near Wasaga Beach, South Georgian Bay, Ontario, June 9, 1929.

Wilsonia pusilla pusilla (Wilson). WILSON'S WARBLER.—One record, kindly supplied me by T. E. Randall, who found a nest with three young warblers and one young Nevada Cowbird at Boyle, Alberta, June 12, 1934.

Sturnella neglecta Audubon. WESTERN MEADOWLARK.—Previously recorded as a victim of the Nevada Cowbird, the Western Meadowlark has been found to be a host of the Eastern Cowbird as well in eastern Nebraska (Nebr. Bird Rev., 2, no. 3: 69, 1934).

Agelaius phoeniceus californicus Nelson. BICOLORED RED-WING.—A second record has come to my attention,—Davis (Condor, 35: 152, 1933) found a parasitized nest in Butte Co., California. The cowbird in question is the race *artemisiae*.

Agelaius phoeniceus nevadensis Grinnell. NEVADA RED-WING.—One record, a nest with four eggs of the Red-wing and one of the Nevada Cowbird, June 1, 1936, Furnace Creek Ranch, Death Valley, reported by M. French Gilman (Condor, 39: 90, 1937).

Carpodacus purpureus purpureus (Gmelin). EASTERN PURPLE FINCH.—T. E. Randall writes me that he found a nest with three eggs of the finch and two of the Nevada Cowbird at Boyle, Alberta, on May 30, 1934. This is the third record for the Nevada Cowbird.

Carpodacus mexicanus frontalis (Say). HOUSE FINCH.—A second record of the Dwarf Cowbird victimizing this bird is given by Hanna (Condor, 35: 205, 1933) from the San Bernardino Valley, California.

Loxia curvirostra pusilla Gloger. RED CROSSBILL.—Saunders and Dale (Trans. Roy. Canad. Inst., 19, pt. 2: 240, 1933) record a nest with three eggs of the crossbill and one of the cowbird, now in the Saunders collection, taken on April 29, 1909, two miles east of London, Ontario. This is the first record of any crossbill as a molothrine victim.

Pipilo erythrophthalmus erythrophthalmus (Linnaeus). RED-EYED TOWHEE.—Coues (Bull. U. S. Geol. and Geogr. Surv., 4: 599, 1878) records a nest with two eggs of the towhee and three of the Nevada Cowbird. This is the only record known to me of this towhee being victimized by the Nevada Cowbird; it is very commonly parasitized farther east by the Eastern Cowbird.

Ammodramus savannarum australis Maynard. EASTERN GRASSHOPPER SPARROW.—Previously known from a single definite nest record and an indefinite statement. Price (Oologist, 51: 107-108, 1934) examined about one hundred nests in Paulding Co., Ohio, and found cowbirds' eggs in two of them.

Ammodramus savannarum bimaculatus Swainson. WESTERN GRASSHOPPER SPARROW.—A third record of this form as a host of the Nevada Cowbird has come to my attention,—a nest found by Neal Weber, at Towner, North Dakota, concerning which the discoverer wrote to Dr. W. M. Mann of the National Zoological Park, who in turn passed the information on to me.

Passerherbulus henslowi henslowi (Audubon). WESTERN HENSLOW'S SPARROW.—Dr. L. E. Hicks informs me that he found a parasitized nest of this sparrow in Franklin Co., Ohio. This is the first record for the Western Henslow's Sparrow (see also Auk, 51: 385-386, 1934).

Chondestes grammacus strigatus Swainson. WESTERN LARK SPARROW.—Davis (Condor, 35: 152, 1933) found a nest of this bird containing an egg of the Nevada Cowbird in Butte Co., California. This is the third record for this sparrow as a host of the Nevada Cowbird.

Zonotrichia leucophrys leucophrys (Forster). WHITE-CROWNED SPARROW.

—In the Royal Ontario Museum of Zoology, at Toronto, there is a nest of one egg of the White-crowned Sparrow and two eggs of the Nevada Cowbird, collected at Okotoks, Alberta, June 8, 1907, by E. Beaurre. This is the second case of which I know for the Nevada Cowbird.

Melospiza melodia heermanni Baird. HEERMANN'S SONG SPARROW.—One record; Arnold (Condor, 39: 35, 1937) found a parasitized nest with five eggs of the sparrow and one of the Dwarf Cowbird at Stockfarm Scout Camp, Coalinge Area, Fresno Co., California, on April 28, 1934.

TANGAVIUS AENEUS (Wagler). Red-eyed Cowbird

Two additional hosts have been reported for this cowbird, bringing the total number of its known victims up to thirty-four. These two are as follows:

Thryophilus modestus pullus Ridgway. CHIAPAS WREN.—Stone (Proc. Acad. Nat. Sci. Philadelphia, 84: 336, 1932) records a young Red-eyed Cowbird being fed by this wren at Cantarranas, Honduras, August 5. The cowbird in question is the race *intolucatus* Lesson, whose hosts now total twenty-four forms.

Piranga erythrocephala candida Griscom. GRISCOM'S TANAGER.—J. T. Wright informs me that on July 21, 1933, at Rosario, Sinaloa, he found a nest of this tanager containing a young cowbird (subspecies *milleri*). The young tanagers had been crowded out and the parasite was the sole occupant.

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BIRD REMAINS FROM THE WEST INDIES

BY ALEXANDER WETMORE

1.—RECORDS FROM CAVE DEPOSITS ON CROOKED ISLAND, BAHAMAS

DURING the winter of 1933-34, Dr. Froelich G. Rainey while traveling with Allison Armour on the yacht "Ulowana" had opportunity to make archeological studies on Crooked Island in the Bahamas. During the course of these investigations a small collection of bird bones was obtained that have come to me for identification from the Peabody Museum of Yale University. Dr. Rainey informs me that the material came from one of the Gordon Hill caves, which are along the beach on the northeast shore of the island. The deposit containing the bird bones was a relatively hard stratum about one foot in thickness, buried under from six to twelve inches of sand. In addition to bones of birds it contained ash and charcoal, many opercula of conch shells, some crude pottery, and a few bone artifacts and tortoise-shell fishhooks. The bones seem fairly old, and are considered pre-Columbian though there is no definite criterion to establish their actual age. Several distributional records of interest are included as the following list will show. Identifications are made under specific names without regard to subspecies recognized at present from this area.

MANX SHEARWATER, *Puffinus puffinus* (Brünnich).—Two metacarpals attributed to this species measure respectively 41.9 and 43.2 mm. in total length. This species is known from Bermuda but has not been reported previously from the Bahama Islands.

AUDUBON'S SHEARWATER, *Puffinus lherminieri* Lesson.—A metacarpal and a tibio-tarsus come from this small species.

BERMUDA PETREL, *Pterodroma cahow* (Nichols and Mowbray).—A metacarpal, ulna (broken into two parts) and a radius are equivalent in size to the same bones of the petrel of the Bermudas, and on this basis are identified with it. Osteological material representing this group of petrels fully is not available due to the rarity of these birds in collections, and it is barely possible that the bones listed are from an unknown species now extinct. The ulna and radius are very slightly shorter than one specimen of each of the Bermuda Petrel in the U. S. National Museum, the difference being that found between sexes in birds of this group. Otherwise they are identical with those of *P. cahow*. They are decidedly shorter than the ulna and radius preserved in skins of *Pterodroma hasitata* and *P. caribbaea*, so that these two are eliminated from consideration. From the material at hand there is no reason for not considering the species identical with that of Bermuda. The identification of *P. cahow* from Crooked Island marks an

extension of range for this species which, however, is not surprising in view of the wide distribution of other species in this group.

WHITE-BELLIED BOOBY, *Sula leucogaster* (Boddaert).—The distal end of a humerus and a coracoid are white in color and appear less old than the other material in the collection.

WHITE IBIS, *Guara alba* (Linnaeus).—The distal parts of an ulna and of a tibio-tarsus are clearly of this species. So far as I am aware this is the first record of the White Ibis for the Bahama Islands.

OSPREY, *Pandion haliaetus* (Linnaeus).—The distal end of a tibio-tarsus comes from an Osprey though there is no certainty as to the subspecies represented.

SOOTY TERN, *Sterna fuscata* Linnaeus.—Represented by two coracoids.

WHITE-CROWNED PIGEON, *Columba leucocephala* Linnaeus.—Humerus, metacarpal, coracoid and metatarsus.

BAHAMA PARROT, *Amazona leucocephala* Linnaeus.—So far as I am aware there is no modern record of the parrot from Crooked Island so that the premaxilla in the present collection is of some interest. Whether this bird was native to the island where the bone was obtained must remain uncertain though it seems probable that this is the case.

Corvus sp.—The distal end of a tibio-tarsus comes from a bird with the dimensions of the female of *Corvus leucognaphalus* of Hispaniola and Puerto Rico. It is probable that it is the same as cave material from Great Exuma Island, which I have identified as *Corvus nasicus*, a species that occurs on Great Caicos Island in the southern Bahamas.

BAHAMAN MOCKINGBIRD, *Mimus gundlachii* Cabanis.—A complete tibio-tarsus is easily identified as from this strong-legged bird.

2.—BIRD REMAINS FROM A KITCHEN MIDDEN ON PUERTO RICO

This report deals with bird bones collected by Dr. Froelich G. Rainey, in 1934, from an extensive midden deposit at Barrio Canas, a mile and a half east of Ponce on the south coast of Puerto Rico. According to information supplied by Dr. Rainey, two distinct cultures are evident in this mound. The lower one, called the crab culture, at the lowest level consists of a well-defined stratum of disintegrated land-crab shells in which were pottery remains of advanced type with red and white painted designs, rectangular stone celts and shell spoons. Above this was the later shell level, or shell culture, tentatively associated with the Arawak-speaking Indians present in Puerto Rico at the time of the Discovery. The shell deposits consist of masses of conch, oyster, clam, scallop and snail shells mixed with blackened earth and ashes, crude, poorly fired pottery and implements. This shell culture extends to within a quarter of a meter of the surface and is overlain by more modern deposits. The crab level at the base of the mound is dis-

tinctly older. In some sections of the mound the shell-culture material extended to a depth of two meters, though in other parts it was no more than a meter deep.

The list of birds identified that follows gives several interesting records, as well as further indication of the abundance of the rail, *Nesotrochis*. The depths at which material was obtained are indicated in quarter meters, and are in the shell level unless definitely stated to come from the stratum of the crab culture.

PIED-BILLED GREBE, *Podilymbus podiceps* (Linnaeus).—A left humerus, complete except for the head, was obtained at a depth of between a half and three-quarters of a meter.

BROWN PELICAN, *Pelecanus occidentalis* Linnaeus.—Represented by the posterior angle of a lower jaw and the head of a humerus found above a depth of three-quarters of a meter.

WHITE IBIS, *Guara alba* (Linnaeus).—A right coracoid nearly complete was obtained in the older deposits of the crab culture. Modern records for this bird in Puerto Rico have been few, though the species is still found in the swamps of the Dominican Republic to the westward.

GLOSSY IBIS, *Plegadis falcinellus* (Linnaeus).—Represented by the distal half of a humerus found at the level of the crab culture.

FLAMINGO, *Phoenicopterus ruber* Linnaeus.—The distal end of a humerus comes from the crab-culture level. The Flamingo has not been seen in Puerto Rico in many years.

WEST INDIAN TREE-DUCK, *Dendrocygna arborea* (Linnaeus).—Bones of this tree-duck come from both shell and crab cultures extending from a depth of half a meter downward.

BLACK-BELLIED TREE-DUCK, *Dendrocygna autumnalis* (Linnaeus).—Three broken humeri found near the surface and in the older, lower levels are distinguished from similar bones of *Dendrocygna arborea* by slightly smaller size and more slender form. This species has been found only in small numbers in modern times in the island.

RED-TAILED HAWK, *Buteo jamaicensis* (Gmelin).—The distal part of a humerus was found in the shell level.

BROAD-WINGED HAWK, *Buteo platypterus* (Vieillot).—A complete right tibio-tarsus was excavated in the shell level. The species is rare in the forests of Puerto Rico at the present time.

DEBOOY'S RAIL, *Nesotrochis debooyi* Wetmore.—Of this, the most abundantly represented bird throughout these deposits, there are numerous bones ranging from just below the surface of the mound in deposits apparently quite modern, to the deepest layers of midden material in the crab culture. Apparently this curious bird was common in this area and was much sought by the aborigines.

The collection includes one left humerus in good state of preservation that illustrates fully the peculiarities of relatively small size and reduced crest for the attachment of flying muscles characteristic of this bird. This specimen has the following measurements: total length, 64.3; transverse breadth of distal end, 10.2; transverse breadth of shaft at center, 4.3 mm. The bone is slightly larger than one seen from St. Croix.

Fragments of the metatarsus are numerous and include four complete specimens as well as one from a young individual in which ossification is not yet complete. Measurements, including what is available from broken specimens as well as from four complete individuals, are as follows:

Total length, 74.6, 75.3, 83.3, 83.4 mm.

Transverse breadth of head, 13.9, 14.0, 14.2, 14.5, 15.0, 15.3 mm.

Transverse breadth of trochlea, 6.3, 6.7, 14.1, 14.2, 14.7, 14.9, 15.1, 15.8, 15.9 mm.

Transverse breadth of shaft at center, 5.8, 6.0, 6.3, 6.4, 6.8 mm.

This material is especially important as heretofore only one complete metatarsus has been found. The measurements are all slightly larger than those of the single complete specimen seen from St. Croix.

The remaining bones are from the tibio-tarsus and femur which are well known and require no special comment, except to note that the humerus and metatarsus seem slightly larger than specimens examined from St. Croix (see Wetmore, A., *Journ. Agric., Univ. Puerto Rico*, January, 1937, pp. 9-10). Possibly two geographic races are concerned, but the differences are so slight that study of more material is required to settle this.

PURPLE GALLINULE, *Ionornis martinica* Linnaeus.—One metatarsus, with the head missing, from the shell level.

WILLET, *Catoptrophorus semipalmatus* Gmelin.—A complete left humerus from a depth of about a meter.

ROYAL TERN, *Thalasseus maximus* (Boddaert).—A nearly complete ulna from the same level as the Willet.

SCALED PIGEON, *Columba squamosa* Bonnaterre.—Represented by humerus and ulna from a depth of between a quarter and a half a meter.

PUERTO RICAN PIGEON, *Columba inornata* Vigors.—Several bones come from the same depth as those of the Scaled Pigeon.

Numerous other pigeon bones, principally of the ulna, were found throughout the entire depth of the midden but are not specifically identified. Part of them belong in the genus *Columba*.

ZENAI DA DOVE, *Zenaida zenaida* (Bonaparte).—A humerus was found between a quarter and a half a meter below the surface, and a metacarpal in the crab level.

RUDDY QUAIL-DOVE, *Oreopeleia montana* (Linnaeus).—A coracoid was excavated from the level of the crab culture.

PUERTO RICAN QUAIL-DOVE, *Oreopeleia larva* Wetmore.—Two bones of

this extinct species come from depths of between a quarter and a half meter. An ulna is slightly larger and more robust than that bone in *Oreopeleia montana*, measuring 43.3 mm. in total length. A complete tibiotarsus, while preserving the slender, elongated form of the modern species, *montana*, is distinctly larger. It measures as follows: total length, 58.5; transverse breadth of distal end, 6.0; transverse breadth of shaft near center, 2.9 mm. Right and left humeri were obtained in the oldest levels, in the crab culture, one perfect and the other nearly so. They measure as follows: total length, 36.9, 37.3; transverse breadth through head, 13.0, 13.0; transverse breadth of distal end, 9.3, 9.3; transverse breadth of shaft at center, 4.4, 4.8 mm. The additional record of this species, known only from bones obtained in cavern and midden deposits, is of importance.

PUERTO RICAN CROW, *Corvus leucognaphalus* Daudin.—A complete ulna was secured at a depth of between a half and three-quarters of a meter from the surface.

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STATUS OF THE "WHITE-EYED" MURRE¹

BY ROBERT A. JOHNSON

Plate 5

THE systematic position of the "White-eyed" Murre (*Uria aalge aalge*), has long been a controversial issue. Birds with a white line of feathers around the eye and a white streak extending backward along the postocular groove called "white-eyed," "ringed," "spectacled," or "bridled" Murres, were noted by early travelers who wrote about sea-bird colonies and were then, as they are today by some observers, considered a different species from the birds not so marked. These striking birds occur throughout the range of the typically colored members of the Common Murre, *Uria aalge aalge* (Pontoppidan). From time to time specific rank has been officially accorded them, although at present they are not generally admitted to such distinction. Nevertheless the question has neither been dropped nor satisfactorily settled. Recent writers (Oberholser, 1920; Ridgway, 1919) express the belief that the bird should again be given specific recognition. The problem is of special interest to ornithologists, and is also a significant one from the point of view of general biology.

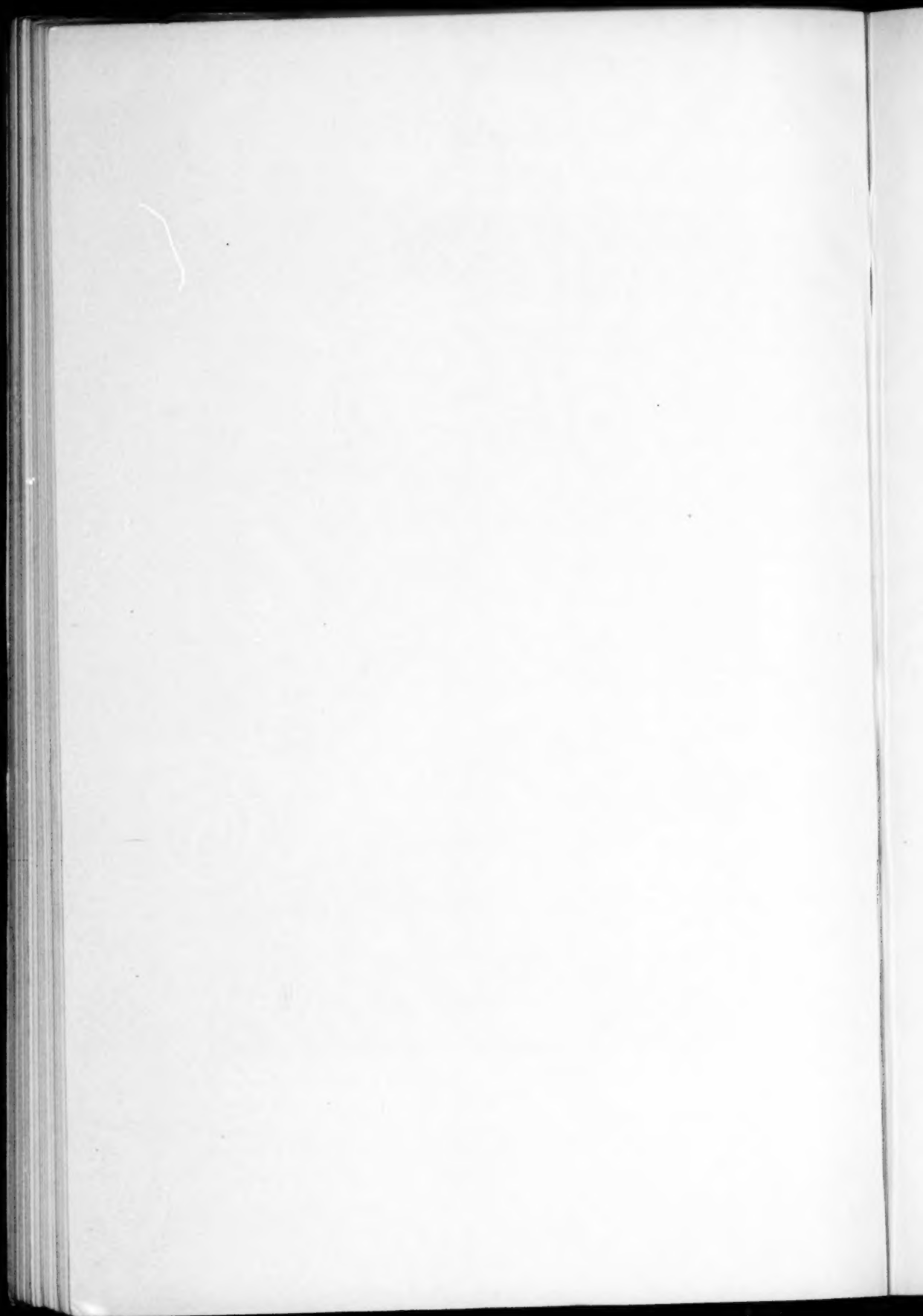
In discussing this problem, A. C. Bent (1919), presented some of the conflicting evidence and left the case undecided, although he seems inclined to regard it as a species. He writes: "Mr. William Brewster (1883), Dr. Louis Bishop (1889), and Mr. C. J. Maynard (1896) all reported this bird in mated pairs on Bird Rock and suggested that it is entitled to specific rank. On my visit to Bird Rock in 1915, eleven Ringed Murres were noted in a group by themselves. Dr. Townsend, the same season, saw about fifteen together in one place, on the south coast of Labrador, all belonging to this form."

Oberholser (1920) proposed *Uria ringvia* for the forthcoming A. O. U. Check-list, but in 1924, before the publication of the Check-list, dropped the suggestion. Ridgway (1919) had used the name *Uria ringvia* and Ogilvie-Grant, in the 'Catalogue of the Birds of the British Museum' (1898), lists the form as a variety. McWilliam (1930) has summarized the discussion from the European point of view. He calls attention to the European records which show that these white-eyed birds occur much more commonly among the northern British breeding colonies than they do among the southern British colonies. He says: "I do not know of any colony in Britain where it is entirely absent and, on the other hand, there is no colony known where it alone is found." From Ussher and Warren's interest-

¹ This study is part of a thesis for the Department of Ornithology, Cornell University. It was read before The American Ornithologists' Union at the Toronto meeting, October 1935.



WHITE-EYED AND NORMAL MURRES WITH THEIR YOUNG



ing book, 'The Birds of Ireland,' we learn that the White-eyed Murre occurs in all colonies of the species, but scarcely one white-eyed to fifty of the ordinary type, and that the white-eyed are never grouped together. On the Isle of Man little is known about these birds except that a few have been seen among ordinary birds on Spanish Head. In North Wales one seldom meets with them. One report gives one White-eyed Murre to two or three hundred of the ordinary type. In West Scotland, a count of over 1500 dead birds disclosed the presence of two of this kind. Grey estimates that there is only one white-eyed bird to five hundred of the others. In the Hebrides where the Northern Murre breeds they are much more common. The birds of Scotland and Wales are, I believe, generally considered to be of the southern British form. A census made in the Outer Hebrides in 1871 by Feilden and Harvie-Brown gives 24 of the white-eyed individuals among 126 birds. Harvie-Brown states that from statistics collected over many years, one to five is about the average in the Outer Hebrides.

Dr. Harrison F. Lewis (1926) has shown from his banding records in 1925 that about 15.7 per cent of the birds breeding along the north shore of the Gulf of St. Lawrence belong to this type, and he also recaptured two of these individuals, marked in a previous year, which had retained the same character. Later, with a larger number available for the year 1929, he found (Lewis, 1930) 128 out of a total of 724 adult Common Murres, or 15.7 per cent of white-eyed individuals. He noted that these were "well scattered among the other Common Murres; some being present in every breeding colony." In one group of fifty birds captured there were eight white-eyed ones.

Thus we have indicated a few of the more important reports in the literature bearing on this discussion. Most observers of sea-bird colonies do not seem to realize the unnatural condition which their presence may cause among the birds, both in behavior and in the distribution within the colonies. A few observers in Europe and also in America have seen a white-eyed and a typical bird paired together. Several other observers seem to think that this is not the case, so that we have many conflicting deductions resulting from little reliable evidence.

Regarding the relative numbers of White-eyed Murres in different parts of the range, the counts which have been reported are very interesting. From these, perhaps, we may approximate the relative distribution as follows: in North America 16 per cent, in the Hebrides 25 to 30 per cent, in southern British waters less than 1 per cent, and in the Bear Island region from 30 to 50 per cent.

During two summers of field observations which took me to most of the large breeding colonies along the north shore of the Gulf of St. Lawrence, I have gathered considerable data pertaining to these birds which, with

other material supplied largely by Dr. Lewis, I believe is ample to show that this form, *Uria ringvia*, has no claim to specific distinction. My findings are presented in summary form as follows:

1. The white-eyed individuals of the Atlantic Murre mate with normal or typically colored birds more often than with one another. Of five mated pairs that I have studied at some length from a blind, four were mixed matings; that is, a white-eyed individual was mated with a typical bird. White-eyed birds seen courting on the rocks have most often been involved with a typical bird. Clearly the matings are purely random.

2. The white-eyed birds are on the whole fairly evenly distributed throughout the nesting colonies. I have never seen any indication of their grouping together although it is not uncommon to see three or more in close proximity within a colony.

3. The eggs belonging to pairs which involve one or more white-eyed birds exhibit the normal range of color types. However, I have not been able by sexing birds to determine that a given egg was produced by a white-eyed female in more than one case. This egg was of the blue-green color type. On this point many reports are conflicting. But, since we now know that in the case of the Murre, the sexes alternate in the performance of the incubation duties, and that the sexes cannot be distinguished by sight, it seems certain that most of the observers who have reported on the color of the egg of *ringvia* should have been uncertain about the egg reported belonging to such a female. It might just as well have been a case of a white-eyed male tending the egg of his mate, a typically colored female. More definite data regarding the color of eggs of known parentage are desirable.

4. Young birds with one or two white-eyed parents are indistinguishable from all the others at hatching and up to the time when they leave the nesting islands at approximately three weeks of age. Experiments with young birds taken when ready to leave the islands and kept in captivity, indicate that the character of the juvenal plumage is clearly observable before they leave the nesting colonies. This leads me to believe that the white-eyed character does not become apparent until the adult plumage is developed. I have found no signs of it in these young and juvenal birds.

5. Dr. Lewis has shown through his banding activities that adult breeding birds with the white-eyed characteristic retain it from one year to another.

6. The white-eyed adult individuals are representative of *Uria aalge* in showing the normal variations in size and measurements.

CONCLUSIONS

The foregoing evidence seems to settle the question of specific distinction but leaves us with the more interesting question, What is the explanation of this white-eyed character? My belief is that we have here a hereditary characteristic operating as a recessive. Whether it is due to the operation of one gene or to the collective influence of more than one, I do not know, but I should not be surprised if it were found to be due to a single gene.

If there is absolutely random mating and the character does not tend to be lethal, the proportion of white-eyed birds in any population would eventually reach an equilibrium anywhere from less than one in five hundred to a very high percentage. This, in fact, seems to be the actual condition in different parts of the range of the species. Accepting this theory, other interesting observations might be made. The relatively small percentage of white-eyed Murres reported in southern British breeding colonies is good evidence that there is not much, if any, intermingling between the southern birds named by Witherby, in 1925, *Uria aalge albionis* and the northern form, *Uria aalge aalge*. In fact, this very discrepancy found in the different geographical areas does, I believe, give weight to the idea that they are segregated breeding populations. Why the white-eyed birds are rare in the southern British breeding populations is another question. From the literature on the subject I gather that there has been a great diminution in these southern populations within recent decades. If the human factor has been important in causing this loss and if there has been selective collecting of individuals and eggs of this recessive form, the effect would be noticeable. Thus, with the human element, the lower the proportion of the rare form, the more they would be desired by collectors, making the character in question more and more lethal to the species. Salomonsen's report of 63 per cent in a collection of 65 birds from the Bear Islands, when compared with other reports of live birds from the same region, indicates this kind of collecting. As far back as 1864, in some regions at least, the white-eyed birds were being collected apparently whenever possible (Cordeaux, 1864; Boulton, 1864). Since there was a standing demand for these specimens, sea-fowlers no doubt were on a constant lookout for them.

From the North American range we have insufficient data for detecting any segregated breeding populations on the basis of the proportions of white-eyed individuals present.

I am indebted to Dr. Allan Cameron Fraser, Department of Plant Breeding, Cornell University, for valuable council in connection with this hereditary discussion.

LITERATURE CITED

- ALLEN, J. A.
1880. On recent additions to the ornithological fauna of North America. Bull. Nuttall Ornith. Club, 5: 85-92.
- ATKINSON, J. C.
1870. British birds' eggs and nests popularly described. 12mo, London, ed. 2, iii + 182 pp., illustr.
- BENT, ARTHUR C.
1919. Life histories of North American diving birds. Bull. U. S. Nat. Mus., no. 107, xiii + 245 pp., pl. 1-55.
- BERTRAM, G. C. L., AND LACK, DAVID
1933. Notes on the birds of Bear Island. Ibis, (13) 3: 283-301 (see p. 298).
- BISHOP, LOUIS B.
1889. Notes on the birds of the Magdalen Islands. Auk, 6: 144-150 (see p. 145).
- BOULTON, W. W.
1864. Ringed Guillemot at Flamborough. Zoologist, (1) 22: 9211-9212.
- BREWSTER, WILLIAM
1884. Notes on the birds observed during a summer cruise in the Gulf of St. Lawrence. Proc. Boston Soc. Nat. Hist., 22: 364-412.
- CORDEAUX, JOHN
1864. Remarks on the birds seen during a visit to Flamborough, in the last fortnight of July, 1864. Zoologist, (1) 22: 9243-9247.
- HARVIE-BROWN, J. A.
1902. Further notes on the birds of the Outer Hebrides. Ibis, (8) 2: 275-278.
- JONES, RICHARD
1914. "Ringed" Guillemot in Anglesey. British Birds, 8: 54.
- LEWIS, HARRISON F.
1926. The banding of Common Murres. Bull. Northeastern Bird Banding Assn., 2: 1-3.
1930. Notes on banding operations on the north shore of the Gulf of St. Lawrence in 1929. Bird-banding, 1: 95-103.
- McWILLIAM, J. M.
1930. The problem of the Ringed Guillemot. Scottish Naturalist, for 1930, pp. 155-158.
- MILNER, WILLIAM M. E.
1848. Some account of the people of St. Kilda and of the birds of the Outer Hebrides. Zoologist, (1) 6: 2054-2062.
- NEWTON, ALFRED
1865. Notes on the birds of Spitsbergen (conclusion). Ibis, (2) 1: 496-525 (see p. 521).
- OBERHOLSER, HARRY C.
1920. Fifth annual list of proposed changes in the A. O. U. 'Check-list' of North American birds. Auk, 37: 274-285.
1924. Ninth annual list of proposed changes in the A. O. U. 'Check-list' of North American birds. Auk, 41: 590-595.
- OGILVIE-GRANT, W. R.
1898. Catalogue of the birds of the British Museum, vol. 26 (see pp. 572-575).
- REINHARDT, J.
1861. List of the birds hitherto observed in Greenland. Ibis, (1) 3: 1-19 (see p. 2).

RIDGWAY, ROBERT

1919. The birds of North and Middle America. Bull. U. S. Nat. Mus., no. 50, pt. 8 (see p. 719).

SALOMONSEN, FINN

1931. Beretning om en Rejse til Faerøerne. Dansk. Orn. Forenings Tidsskr., 25: 3-37.

1932. Description of three new guillemots (*Uria aalge*). Ibis, (13) 2: 128-132.

SAXBY, HENRY L.

1865. Ornithological notes from Shetland. Zoologist, (1) 23: 9401-9405, 9518-9526, 9566-9572 (see pp. 9401, 9568, 9766).

SELOUS, EDMUND

1905. The bird watcher in the Shetlands. 8vo, New York (see p. 210).

TOWNSEND, CHARLES W.

1918. In Audubon's Labrador. 8vo, Boston.

USSHER, RICHARD J., AND WARREN, ROBERT

1900. The birds of Ireland (etc.). 8vo, London, xxxii + 419 pp., illustr. (see pp. 361-365).

WALKER, THEODORE C.

1868. Remarks on the birds of Ailsa Craig. Zoologist, (2) 3: 1365-1373 (see p. 1371).

WITHERBY, H. F.

1923. Notes on the Common Guillemot—a new British form. British Birds, 16: 323-324.

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NOTES ON WATERBIRDS OF THE UPPER TEXAS COAST

BY GEORGE G. WILLIAMS

EXAMINATION of ornithological literature of the last fifty years reveals the surprising fact that except for three or four articles recording observations made during a few days of the year, there has been published no survey of bird life along any part of the Texas coast lying north of the Rio Grande Valley. Yet here is a coast over three hundred miles long, which extends in a north-south direction over two hundred and twenty-five miles. The distance is comparable to that of the entire coastal region between Connecticut and North Carolina. The present paper is an attempt to fill a small part of the gap which exists in our ornithological knowledge of the Texas coast. It is based on observations made from June 18, 1932, to November 8, 1937. These observations centered about Bolivar Peninsula (a strip of land lying at the entrance of Galveston Bay), Galveston Island, and Freeport, Texas (a town about forty miles southwest of Galveston). Unless otherwise noted, all references apply to this forty-mile stretch of coastal country. All waterbirds except the ducks and geese have been included in this survey if they were noted in the region mentioned. Two species,—the Eastern Glossy Ibis and the Pomarine Jaeger,—have not heretofore been recorded (so far as I can learn) from Texas.

In connection with the theory that migrations are influenced by changes in day-lengths, I have been especially interested in observing birds and in recording observations made near June 20–21 and December 20–21 each year. I have likewise been interested in observing and recording seasonal fluctuations in numbers of birds present and in the ages (where distinguishable) of the bird population. Somewhat as an aside, it might be added that these observations apparently point toward the following generalizations:

1. At least some waterbirds may migrate north or south irrespective of the mid-summer change in day-lengths.
2. They may retire southward *after* the winter solstice.
3. Species which have bred in the region may often practically disappear after the breeding season, and then reappear in greater numbers than ever in the autumn.
4. Mature birds linger farther north in winter than do immature birds.
5. The only time of the year when waterbirds of the region do not seem to be migrating is in the period from about January 15 to February 15.

COMMON LOON (*Gavia immer immer*).—A rare bird in the Galveston region, though it is a common winter visitor farther down the coast. About fifty birds were observed on Aransas and Copano Bays, near Rockport, Texas, November 29, 1935. Two birds near Galveston, March 8, 1936.

PIED-BILLED GREBE (*Podilymbus podiceps podiceps*).—Observed in every month

of the year except January, July, August, and September. Earliest record February 19, 1933; latest record December 16, 1935. Female with downy young observed on Galveston Island, June 25, 1934.

WHITE PELICAN (*Pelecanus erythrorhynchos*).—During winter months occasionally present in small numbers about Galveston; common in large flocks in spring and autumn. It is interesting that the species occurs so far east during migration when both the winter home and the breeding grounds lie considerably west of Galveston. Earliest record January 8, 1933, when nine were seen together on Bolivar Peninsula. This flock apparently remained there until February 19, 1933, after which there was a period of cold weather and the birds were seen no more. Latest spring record April 16, 1933. Earliest autumn record July 11, 1933, when a flock of twenty-two birds (some of them young of the year) was observed on a fresh-water pond about twenty miles from the nearest salt water at Freeport.

EASTERN BROWN PELICAN (*Pelecanus occidentalis occidentalis*).—Common the year round, but most numerous in autumn, except at nesting places. A visit on July 1, 1934, to a small island near Galveston revealed a nesting colony of several hundred individuals. A few nests contained eggs in process of incubation, a few contained young apparently only a day or two old; but most contained young about the size of a large chicken.

DOUBLE-CRESTED CORMORANT (*Phalacrocorax auritus auritus*).—Common in every month of the year, but most numerous in May and June.

WATER-TURKEY (*Anhinga anhinga*).—Fairly common throughout the Galveston and Houston region except in winter, but seen once only near salt water, on October 6, 1934, on Galveston Island. Earliest spring record March 19, 1933, fifteen miles from the coast.

MAN-O'-WAR-BIRD (*Fregata magnificens*).—Not uncommon during late summer. Earliest record May 19, 1935, when a flock of five males and two females, all mature, flew over Galveston. Latest record August 12, 1933, at Freeport; but a reliable observer reported them as rather common at Port Lavaca, farther down the coast, September 4, 1934.

GREAT BLUE HERON (*Ardea herodias*).—Ward's Heron nests commonly along the coast, and is joined in winter by the Great Blue Heron; but since the two birds are indistinguishable in the field, autumn and winter records may apply to either. The species is most numerous in October and in February, a circumstance doubtless due to the passing of transient Great Blues on the way to and from regions farther south. No young have been observed in nests after June 15.

AMERICAN EGRET (*Casmerodius albus egretta*).—Observed during every month of the year, but in much reduced numbers during the three winter months. Many hundreds feed together on the coastal flats during August and September, but only isolated individuals appear from December to March.

SNOWY EGRET (*Egretta thula thula*).—Observed in every month of the year, but in much reduced numbers during the winter months. Nesting occurs commonly in many places along the coast.

REDDISH EGRET (*Dichromanassa rufescens rufescens*).—Nests just to the west of Galveston Island, and appears in the Galveston region after the breeding season only. One was observed, however, on March 12, 1933, on Bolivar Peninsula. The next earliest dates for the Galveston region are April 19 and May 31, 1936; the latest record is October 28, 1933, but five were observed on Aransas Bay, near Rockport, November 30, 1935.

LOUISIANA HERON (*Hydranassa tricolor ruficollis*).—Observed during every month

of the year, but not commonly in January, February, and early March. Nesting occurs commonly in many places along the coast, and is normally completed by the end of June.

LITTLE BLUE HERON (*Florida caerulea caerulea*).—Common inland, but not common along the coast except in late summer and autumn. From about the first of June (earliest record May 29, 1934) the immature birds begin to collect together with Snowy Egrets in the flat grassy coastal swamps, where with a very small number of adult birds, they remain until about the first of November (latest date October 28, 1933).

EASTERN GREEN HERON (*Butorides virescens virescens*).—Very common coastwise in May and June, though it disappears from the immediate coastal region very early in autumn. Earliest spring record April 15, 1934; latest autumn record September 13, 1933.

BLACK-CROWNED NIGHT HERON (*Nycticorax nycticorax hoactli*).—Nests commonly in the region. Earliest spring record April 15, 1934, when two immatures with their mother were noted on Galveston Island. Latest autumn record for the coast October 6, 1934, but the species may be found inland in sheltered places until December.

YELLOW-CROWNED NIGHT HERON (*Nyctanassa violacea violacea*).—Never observed near the coast; but in a great heronry near Waller, Texas, and a smaller one near Houston, most of the young were out of the nest and on the wing by June 1, 1933 and 1934. Yet a few small fledglings remained in the nests at that date.

AMERICAN BITTERN (*Botaurus lentiginosus*).—Uncommon migrant in spring and autumn. Earliest spring record February 29, 1936; latest spring record May 6, 1934. Only autumn record October 12, 1934.

EASTERN LEAST BITTERN (*Ixobrychus exilis exilis*).—Nests commonly in the marshes about Galveston Bay, but seldom near the coast. Earliest record for the coast May 19, 1935; latest record for the coast June 16, 1933.

WOOD IBIS (*Mycteria americana*).—Common about Galveston Bay in late summer and early autumn, but never observed near the coast.

EASTERN GLOSSY IBIS (*Plegadis falcinellus falcinellus*).—Observed on Galveston Island, June 25, 1934, where a bird was examined long and closely three different times from a distance of about twenty yards, with eight-power field-glasses.

WHITE-FACED GLOSSY IBIS (*Plegadis guarauna*).—Mostly a bird of the bays, but not uncommon along the coast during summer. All birds observed in the coastal region were seen between June 16 and July 1.

ROSEATE SPOONBILL (*Ajaia ajaja*).—Nests on an island in Galveston Bay. Young leave the nest in late June, scatter over the country in the vicinity of the coast, and then quickly disappear. My latest autumn date is July 17, 1934.

SANDHILL CRANE (*Grus canadensis tabida*).—Two individuals passed over Houston, flying southwest, September 5, 1933. A reliable observer reported five passing over Houston, December 19, 1935.

KING RAIL (*Rallus elegans elegans*).—Not common in the immediate coastal region, though three adults and two sets of downy young were observed on Galveston Island, May 29, 1934, and an adult was feeding with Clapper Rails in a salt marsh near Galveston, July 1, 1934.

CLAPPER RAIL (*Rallus longirostris*).—No individuals were examined during the period, but all were probably Louisiana Clapper Rails (*Rallus l. saturatus*). Common during summer months in salt marshes near the shore. My earliest date is June 8, 1934, when a mature bird and a half-grown young were seen near Freeport. Another small downy young was seen at the same place, June 30, 1934, and two

half-grown young were seen on Galveston Island, August 6, 1935. My latest date for the Galveston region is October 27, 1935; but about twenty were seen farther down the coast at Rockport on November 30, 1935.

PURPLE GALLINULE (*Ionornis martinica*).—Common in summer in the upper region of Galveston Bay, but observed only twice near the coast, April 29, 1934, and December 1, 1933.

FLORIDA GALLINULE (*Gallinula chloropus cachinnans*).—Common in summer near the coast but not in the bays. Earliest record April 19, 1936; latest October 12, 1933, on the upper shore of Galveston Bay. Numerous downy young observed June 16 and June 27, 1933.

AMERICAN COOT (*Fulica americana americana*).—Common throughout the winter months and occasional in the summer. A small flock was reported as an "early fall record" in the upper part of Galveston Bay on August 30, 1935; but my earliest record for the coast is October 12, 1933. Five individuals were observed on June 16, 1933, and two on June 27, 1933, in a pond on Galveston Island. Two were seen on Galveston Island, May 19, 1935.

PIPING PLOVER (*Charadrius melodus*).—Common during spring and autumn, and occasional during winter. Small flocks were seen January 27, 1937, and January 15, 1933; but the next-earliest time the bird was observed within this region was February 19, 1933. It becomes common about March 1, and remains until late April (latest date May 2, 1937, near Freeport). My earliest autumn date is August 12, when six were seen at Freeport. A straggler was noted near Freeport, June 25, 1934.

CUBAN SNOWY PLOVER (*Charadrius nivosus tenuirostris*).—Noted during every month of the year, though it is not common during December and January. It is most numerous during late February and March. Downy young are fairly common along the beaches during June.

SEMIPALMATED PLOVER (*Charadrius semipalmatus*).—Noted during every month of the year except July. It is remarkable that birds are present in some numbers both before and after the summer solstice, and yet disappear for a month after this. Thirty individuals were seen on Bolivar Peninsula, June 18 and June 19, 1932; one was seen there June 16, and four June 27, 1933; three were seen on Galveston Island, June 19, and twenty June 25, 1934. After those dates, the earliest autumn record is August 12, 1933.

WILSON'S PLOVER (*Pagolla wilsonia wilsonia*).—A common summer bird, most numerous in June and July. Earliest spring record March 8, 1937; latest autumn record October 16, 1932. A single straggler was seen on Bolivar Peninsula, January 8, 1933.

MOUNTAIN PLOVER (*Eupoda montana*).—A rare spring migrant. Earliest spring record March 20, 1937; latest spring record June 19, 1934, when one bird was seen on Galveston Island.

KILLDEER (*Oxyechus vociferus vociferus*).—Common at all times of the year. Very small downy young noted May 19, 1935, and half-grown, feathered young June 13, 1934.

AMERICAN GOLDEN PLOVER (*Pluvialis dominica dominica*).—Seldom observed during the period and each time on Galveston Island. Earliest date April 24, 1937, and latest May 6, 1934.

BLACK-BELLIED PLOVER (*Squatarola squatarola*).—Noted during every month of the year, though most of the summer birds are in immature plumage. Earliest spring record of a bird in breeding plumage April 1, 1934. Other significant records of birds in breeding plumage are June 27, 1933 (two birds); July 13, 1933 (one bird); June 8, 1934 (one bird).

RUDDY TURNSTONE (*Arenaria interpres morinella*).—One bird seen December 1, 1933, one January 1, 1933, and five January 27, 1937, all on Bolivar Peninsula. Otherwise, there are no records for December and January. About three hundred were seen on Bolivar, February 19, 1933; but otherwise there are no records for February. From about the first of March to about the middle of May a few solitary birds, some in winter and some in summer plumage, are always in evidence along the beaches. At about mid-May thousands, all in breeding plumage, suddenly appear everywhere near the coast; but within three weeks have disappeared, leaving only a few stragglers. It is remarkable that birds in winter or immature plumage, and also birds in full breeding plumage, are constantly in evidence along the beaches during every day of June, July, and August. By mid-September practically all the birds have lost the summer plumage. The number of birds present is much augmented during August and September, presumably by the return of autumn migrants; but the autumnal birds are never so numerous as were the spring birds. Practically all have disappeared by November 1.

WILSON'S SNIBE (*Capella delicata*).—A not uncommon winter bird inland, but appearing along the coast in the migratory seasons only. My earliest spring record is February 29, 1936, and my latest spring record May 18, 1934. The height of the spring migration comes during the last two weeks of March, when hundreds of birds are to be observed in marshes near the coast. My earliest autumn record is July 13, 1933, when several hundred were seen feeding in a marsh a few hundred yards from the beach. My latest autumn date for the Galveston region is October 6, 1934; but the species was fairly numerous on Aransas Bay, near Rockport, November 30, 1935.

LONG-BILLED CURLEW (*Numenius americanus americanus*).—A common spring and autumn migrant, though it appears inland during the spring much earlier and more frequently than it appears on the coast. My earliest date for the Galveston region is April 19, 1936, when one bird was seen. It lingers along the coast in this region until the end of June. Fifteen birds were observed on Bolivar Peninsula, June 19, 1932; two at Palacios, June 13, 1934; and two near Freeport, June 30, 1934. The earliest autumn record is August 14, 1936; but the species is most frequently seen during September and October. My latest autumn date for the Galveston region is October 28, 1933; but the bird was numerous on Aransas Bay, near Rockport, November 30, 1935.

HUDSONIAN CURLEW (*Phaeopus hudsonicus*).—A regular spring migrant. Earliest record April 13, 1936; latest record May 19, 1935.

UPLAND PLOVER (*Bartramia longicauda*).—A regular but uncommon migrant in spring and autumn. Earliest spring record April 11, 1937; latest spring record April 29, 1934. Only autumn date for the period, August 19, 1934, when about twenty birds were seen at different places near Galveston.

SPOTTED SANDPIPER (*Actitis macularia*).—A winter resident in the region. Latest date seen in spring May 29, 1934; earliest date seen in fall August 6, 1935.

EASTERN SOLITARY SANDPIPER (*Tringa solitaria solitaria*).—A common spring and autumn migrant inland, but not common near the coast. Earliest spring record March 17, 1935; latest spring record May 18, 1934. Observed only once in autumn near the coast, September 15, 1934, when six individuals were seen on Galveston Island.

WILLET (*Catoptrophorus semipalmatus*).—The Eastern Willet breeds in the region, but during the migration season it becomes confused with the Western form. The species has been observed in every month of the year except December and January. The earliest spring records are February 15, 1936, and February 19, 1933. The latest

autumn record is November 11, 1934, at Galveston; but the species was exceedingly numerous November 30, 1935, farther down the coast at Rockport.

GREATER YELLOW-LEGS (*Totanus melanoleucus*).—A regular spring and autumn migrant, and a not infrequent winter resident. Latest spring record May 19, 1935; earliest fall record July 13, 1933, when two birds were seen on Bolivar Peninsula.

LESSER YELLOW-LEGS (*Totanus flavipes*).—Observed in every month of the year, though it is uncommon during December and January. The main migration, when many hundreds may be seen, occurs during the first two weeks of April. The bird is present in small numbers throughout June and July.

AMERICAN KNOT (*Calidris canutus rufus*).—A regular spring and autumn migrant. Earliest spring record April 1, 1934, when one bird, partly in breeding plumage, was observed near Freeport; latest spring record June 16, 1933, when fifty birds in breeding plumage were observed on Bolivar Peninsula. It is generally present in large numbers from the middle of April to the first of June. Earliest fall record July 1, 1934, when three birds with faintly pink breasts were observed on Galveston Island; latest fall record November 8, 1937, when several birds were observed on Galveston Island, all in winter plumage.

PECTORAL SANDPIPER (*Pisobia melanotos*).—A regular spring and autumn migrant. Earliest spring record March 21, 1936, latest spring record May 19, 1935. Earliest autumn record July 17, 1934; latest autumn record October 15, 1934, when five birds were seen.

WHITE-RUMPED SANDPIPER (*Pisobia fuscicollis*).—A regular spring migrant. Earliest record May 6, 1934; latest record May 31, 1936.

LEAST SANDPIPER (*Pisobia minutilla*).—Observed occasionally in spring and frequently in autumn along the coast, though the species is never common. Earliest spring records February 4, 1934, and April 1, 1934; latest spring record May 6, 1934. Earliest autumn record August 2, 1934; latest autumn record October 28, 1933.

RED-BACKED SANDPIPER (*Pelidna alpina sakhalina*).—A very common wintering bird. Latest spring records June 19, 1934, when two birds in summer plumage were seen on Galveston Island; and June 30, 1934, when one bird in summer plumage was seen near Freeport. Earliest autumn record October 31, 1935.

DOWITCHER (*Limnodromus griseus*).—Whether the following data apply to the Eastern or to the Long-billed form of the species I do not know. An infrequent spring and common autumn migrant. Earliest spring record March 21, 1936, when a few individuals in summer plumage were observed; latest spring record May 19, 1935, when seven individuals in summer plumage were observed. Ten birds in winter plumage were noted June 18 and 19, 1932; and thirty birds in winter plumage and one bird with a reddish breast as in the summer plumage were noted June 19, 1934. Earliest autumn record July 13, 1933; latest autumn record November 8, 1937, when three birds were seen on Galveston Island.

STILT SANDPIPER (*Micropalama himantopus*).—An infrequent spring and autumn migrant. Earliest spring record May 6, 1934; latest spring record May 19, 1935. My only autumn date for the species is September 16, 1934.

SEMIPALMATED SANDPIPER (*Ereunetes pusillus*).—A common wintering bird which has been observed during every month of the year in the Galveston region. Significant records are these: about one hundred seen on Bolivar Peninsula, June 27, 1933, all the birds in breeding plumage; about sixty in breeding plumage were seen on Galveston Island, June 19, 1934. The earliest date that probably involves true autumn migrants is July 13, 1933, when about fifty birds were observed. The height of the migrations occurs in early May and in early August.

WESTERN SANDPIPER (*Ereunetes maurii*).—Observed in every month of the year although the bird is common in spring and autumn only. Earliest spring record February 13, 1937. Four seen as late as June 27, 1933, and twenty on June 25, 1934. Birds are most numerous in early May and in early August.

SANDERLING (*Crocethia alba*).—Observed during every month of the year, but not common in early July. Two birds in summer plumage were observed on Bolivar Peninsula, June 16, 1933; two in summer plumage June 27, 1933, near Freeport; two in summer plumage June 19, 1934, on Galveston Island; and one in summer plumage June 25, 1934, on Galveston Island. About the middle of July, the birds (all in winter or juvenal plumage) become more numerous, as migrants from the north join those that have lingered in the south.

BLACK-NECKED STILT (*Himantopus mexicanus*).—A common summer resident and breeder. Earliest spring record March 21, 1936; latest autumn record September 16, 1934.

WILSON'S PHALAROPE (*Steganopus tricolor*).—A regular but not common spring and autumn migrant. Earliest spring record May 18, 1934; latest spring record June 25, 1934, when seven birds in breeding plumage were seen on Galveston Island. Earliest autumn record August 6, 1934; latest autumn record August 12, 1933.

POMARINE JAEGER (*Stercorarius pomarinus*).—One bird seen on Bolivar Peninsula, June 16, 1933, and June 27, 1933. Examined at close range with good glasses, and identified definitely as this species.

HERRING GULL (*Larus argentatus smithsonianus*).—Noted during every month of the year, though only a few stragglers remain during June and July. The species is most numerous from mid-November to mid-April. During this period it may be observed by the thousands along the beach and in favorable spots along the lower bay shore. All birds observed from the first of June to the last of December are in immature plumage; but after early January a few birds in adult plumage begin to appear. Their number reaches a maximum in late February and early March, and from mid-March to June their number gradually diminishes. At its maximum, however, the number of adults in proportion to immatures is hardly more than one to ten. My earliest record of an adult is January 8, 1933, and my latest record May 18, 1934, when seven adults were seen.

RING-BILLED GULL (*Larus delawarensis*).—Noted during every month of the year, though only a few stragglers remain during June and July. The species is most numerous from mid-October to mid-April, when it may be observed by the thousands feeding and flocking with Herring Gulls. Both immature and adult birds may be seen on almost any day of the year; but during the autumn and winter months the adult birds are in a majority of perhaps five to one over the immatures. During April and May, however, the proportion is reversed; and during June and July the few birds seen may sometimes be adults, and sometimes immatures.

LAUGHING GULL (*Larus atricilla*).—A very common summer resident and breeder in the region, but recorded during every month of the year. During very mild winters it may be numerous during December and January, although as a rule it is by no means abundant in those months. Immature birds are not common in the winter. The number of local birds is vastly augmented during April, September, and October as migrants from other regions pass along the coast. A few birds begin assuming the summer plumage by the first of February, and all adult birds have assumed it by March 20. A few immature birds appear in spring with the adults, but they assume adult plumage during May. Finally, a few adults begin to assume the winter plumage during the last week of June, and all have acquired complete winter plumage by

the end of the first week in August. Thereafter the number of birds present diminishes sharply, due doubtless to the emigration of individuals which have bred or been hatched in the region. This scarcity of Laughing Gulls persists until the first week in September, when the migrants from farther north and east begin to appear in huge flocks along the beaches or migrating southwestward along the coast. In years when hurricanes with their high tides do not disturb nesting activities, most of the young are on the wing by July 1; but in unfavorable years the majority of young may not take to the air until mid-July or later.

BONAPARTE'S GULL (*Larus philadelphia*).—A regular but not common spring migrant. Earliest date January 27, 1937; latest spring date April 15, 1934.

GULL-BILLED TERN (*Gelochelidon nilotica aranea*).—Breeds in the region and has been noted in every month of the year. Though common, it is not an abundant species at any time. Young on the wing were seen as early as May 6, 1934.

FORSTER'S TERN (*Sterna forsteri*).—A very common summer resident and breeder in the region. Earliest spring record February 5, 1933; latest autumn record October 27, 1935; but the species was fairly abundant near Rockport, November 30, 1935. Near Galveston it is most abundant in March. Many pairs were observed copulating March 19, 1934; young on the wing June 8, 1934.

COMMON TERN (*Sterna hirundo hirundo*).—This species was definitely identified three times only in the entire period: April 16, 1933; May 18, 1934, when several hundred were observed; and June 27, 1933.

LEAST TERN (*Sterna antillarum antillarum*).—A very common summer resident and breeder. Earliest spring date April 11, 1937; latest autumn date September 13, 1933, though one bird was shot September 20, 1923. The species is most abundant in early August. Eggs and very small downy young were noted June 8, 1934; and a nest with eggs being incubated was found June 20, 1933.

ROYAL TERN (*Thalasseus maximus maximus*).—A very common summer resident and breeder, observed in every month of the year. The birds are not abundant except at the breeding places until late May, when thousands of adults and immatures appear along the beaches. Most of the immature birds disappear by mid-August; then in September and October there comes a great influx of both adult and immature birds numbering in the thousands. Most of these birds gradually disappear until, in February, only a few scattered adults remain. Pairs were noted copulating April 8, 1934; and one pair was apparently copulating August 17, 1933. On July 1, 1934, many hundred young not quite able to fly were observed, along with four downy young and about ten nests of eggs being incubated.

CABOT'S TERN (*Thalasseus sandvicensis aculeatus*).—Noted only once, April 16, 1933, near Freeport.

CASPIAN TERN (*Hydroprogne caspia imperator*).—Noted in every month of the year. Most abundant in early March and October, when scores of birds may be seen flocking with Royal Terns along the beaches. At other times it is common, but not abundant.

BLACK TERN (*Chlidonias nigra surinamensis*).—A common and abundant spring and autumn migrant. In mid-May it appears very suddenly and in vast numbers. Earliest spring date May 2, 1936 (one bird). On May 18, 1934, the first birds in immature plumage were observed along Galveston Island beach. By June 10 (latest date June 8, 1934) all mature birds have disappeared, and immature birds have become slightly more numerous than they were earlier in the season. These immature birds seem to linger along the coast until they are joined by young of the year, which come down from the north during late June and early August. Signifi-

cant summer observations are: June 19, 1932, five birds in adult summer plumage observed a mile from the beach as they flew straight south; June 25, 1934, ten birds in adult summer plumage seen on Galveston Island, along with over one hundred birds in immature plumage; June 30, 1934, observations near Freeport similar to those on Galveston Island on June 25; July 1, 1934, eight birds in adult summer plumage seen on Galveston Island, along with many hundreds of birds in immature plumage. Several close flocks of immature birds were seen flying straight in from the north, reaching the sea-line and dipping down to the water without pausing in their flight, continuing straight out to sea for about half a mile, and then turning to fly west along the coast. Latest autumn date for the period September 13, 1933, when several hundred birds in winter plumage were seen near Freeport; but the species was observed September 20, 1933.

BLACK SKIMMER (*Rynchops nigra nigra*).—An abundant breeder in the region, noted in every month of the year. It begins disappearing from the open beaches in mid-April, probably to go to the breeding grounds, and during most of May is not abundant except at the breeding grounds. A visit to a nesting colony June 8, 1934, revealed scores of nests with eggs, about twenty very young downy birds, and all other birds in adult plumage. A visit to the same colony on June 30, 1934, revealed three or four immature birds on the wing, and young birds of all sizes running about on the sand. In winter the species was noted only during January and February of 1933, when several hundred were regularly seen in a favored spot on Bolivar Peninsula.

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MUSCLES OF THE AVIAN HIP AND THIGH

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AN increase of interest in the myology of birds is apparent. The more recent papers on the subject, however, concern themselves with a comparison of the muscles of different avian groups, and pay but slight attention to homologies. There have been few contributions toward an understanding of the latter, and most authors refer to Gadow's work of forty-six years ago (in Bronn's 'Klassen und Ordnungen des Tier-Reichs,' 1891). Exceptional in this respect have been two papers of Romer, one (Jour. Morph., 43: 347-385, 1927) on the development of the muscle groups of the pelvic limb of the chick, and another (Bull. Amer. Mus. Nat. Hist., 48: 533-552, 1923) that considers the muscles of birds rather incidentally with those of (chiefly) *Alligator*. Hudson's paper ('Studies on the muscles of the pelvic appendage in birds,' Amer. Midland Nat., 18: 1-108, 1937) is a notable contribution to our knowledge of interordinal variations of the muscles of the pelvic limb in birds, but unfortunately for the morphological myologist, he failed to consider the innervations, and hence his paper is of little use from this aspect.

Recently I have completed a study of the muscles of hip and thigh of all vertebrate classes, and the results of this, as bearing on mammalian homologies, are contained in a paper now in press, 'Morphogenesis of the architecture of hip and thigh.' This contains only minor references to the conditions in birds, however, for Aves are usually considered, whether rightly or wrongly, as being too specialized to have much bearing on the morphogenesis of other vertebrate classes. Accordingly it appears advisable to offer a separate paper dealing with birds. As the topographical myology of birds is well known, descriptions are reduced to the minimum compatible with a clear presentation. *Gallus gallus* was chosen as the subject for discussion, since it is a type relatively unspecialized and is easily procurable. It is deemed unnecessary to repeat the discussions offered in my paper referred to above; hence the two papers should be used together. A few pertinent points regarding the osteology are mentioned for a better understanding of the discussions.

The posture of birds varies considerably. In some, as penguins, loons, grebes, the position of the trunk, when on land, is largely vertical, in order to bring the center of gravity above the acetabula, and may be likened to that of man. In other sorts the body is inclined at an angle when at rest or while walking, but in many terrestrial types (as *Gallus*) the body is carried with its long axis almost parallel to the ground, a position assumed by no bipedal mammal nor extinct bipedal reptile without a heavy tail for

a counterbalance. This is made possible by a relative decrease in the preacetabular and an increase in postacetabular weight. These different positions of the body have various effects upon the pelvic architecture and its controlling musculature. Of influence also is another factor of moment. As in man, the only exclusively bipedal mammal, so in birds, when travelling on land, the pelvic limbs are the sole support of the body, and supply exclusively the propulsive force. Because of the shift in the center of gravity and the fact that the abdomen is interposed between the thighs, the latter are less approximated than is usual in mammals.

As is to be expected, birds in general have a modified, or even an accentuated, reptilian type of pelvis, with an ilium extending for a relatively great distance both caudal and cranial to the level of the acetabulum, and fused solidly to the sacral vertebrae. The bar-like ischium is directed largely caudally and parallel to the ventral border of the ilium, while the pubis, also bar-like, is more variable in position, but is directed caudo-ventrally. Whether or not these bones are largely fused with their neighbors, there is always a vacuity between ilium and ischium for the passage of peroneal and tibial nerve branches, and between ischium and pubis for the passage of the obturator nerve and muscle.

In many, if not all, birds, including *Gallus*, the roots of the 'lumbar' plexus emerge from the sacral vertebrae, thus indicating that in this class the pelvis has experienced a secondary forward movement, doubtless induced by bipedal habits and the consequent shift in the center of gravity.

All striated muscles are arranged in pairs of groups,—prime movers and their antagonists,—although in the course of specialization of movements the distinctiveness of individual units of these two groups may become obscured. Similarly, nerves to muscles are arranged in corresponding dorsal and ventral branches, to primitive extensor and flexor muscle groups, respectively. Experience has abundantly shown that the innervation of a muscle is the most reliable criterion of its identity; but nerves are subject to evolutionary changes and not only must other factors, as topography in regard to other muscles and nerve trunks, be considered, but the evidence offered by the nerves themselves may be so obscured as to mislead even the most careful anatomist. On the whole, homologies that do not consider the innervations are valueless; if correct they chance to be so on the basis of incomplete evidence.

Because in tetrapods, including birds, the ilium has thrust dorsalward between the lumbar and sacral plexus, there are four main nerve groups and four corresponding muscle groups to the pelvic limb, one pair prozonal and the other metazonal, each pair comprising one dorsal and one ventral element. The femoral (dorsal) and obturator (ventral) are prozonal, but the latter has been secondarily encompassed by the pubis, as in other

vertebrates, so that it now passes through the 'obturator foramen,' between pubis and ischium, and thus has become mesozonal. The peroneal (dorsal) and tibial (ventral) nerves are metazonal, passing between ilium and ischium. Even the highest, shortest branches to the deep hip musculature belong to one or another of these four nerve groups.

There is much evidence in comparative anatomy that in the basic tetrapod condition the dorsal nerve components (femoral and peroneal) innervated a single extensor muscle sheet in the thigh, with corresponding ventral nerve elements (obturator and tibial). This arrangement of single muscle sheets, in layers, dually innervated, still occurs in various degrees in lower tetrapods, and the general topography still suggests it in birds. It is noteworthy, however, that in Aves there is survival of original duality of innervation of but one primitive muscle complex, while there has been established but one new fusion of two unrelated muscle units (biceps and femorocrural), and this incompletely. Thus the primitive condition in mammals, in which there appears to have been segregation of all muscle units into singly innervated slips, is approached.

In spite of the extreme specialization of birds there are only a few muscles of hip and thigh (such as femorocruralis, obturator, insertion of ambiens) that have become markedly altered, and even these, for the most part, present no great difficulty. The remainder, with few exceptions, are readily homologized with the muscles of tetrapods when all pertinent factors are considered. Within the class, however, there is considerable variability in muscle pattern.

Unfortunately the names of the muscles of the vertebrates below mammals are in a state of great confusion; the chief reason is that many of them are compounds of mammalian units. The terms used herewith are those based on the group (extensor or flexor), origin and insertion, or else the homologous mammalian names where there is little or no doubt of the equivalence. Following the name of each muscle I have placed in parenthesis the comparable terms used by Gadow and Hudson, when these differ from mine.

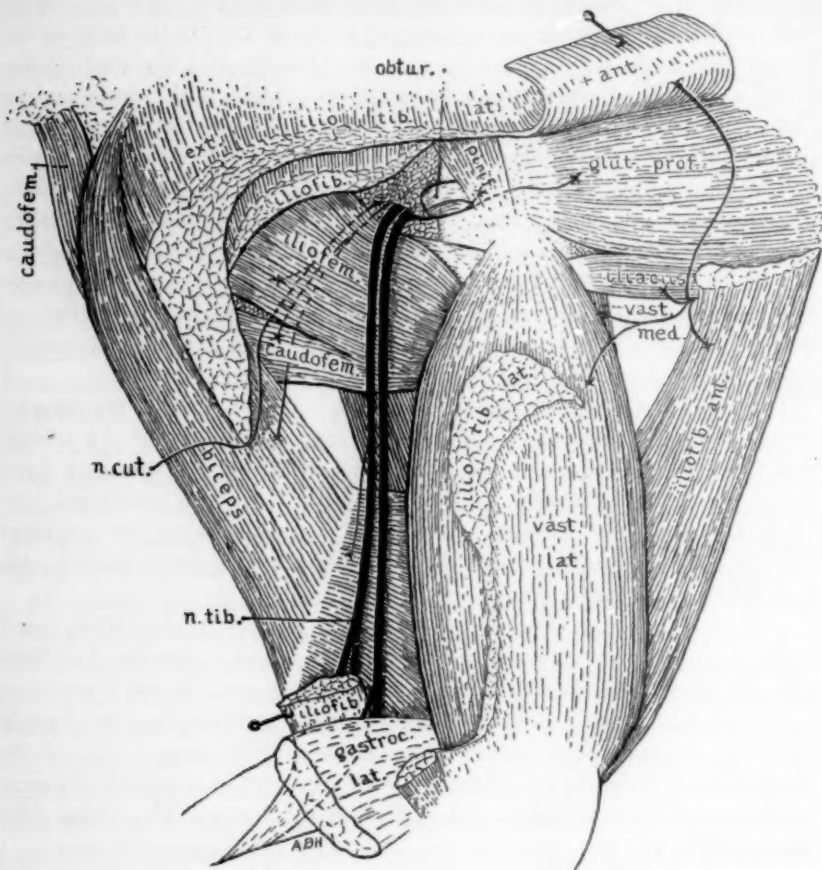
DORSAL (EXTENSOR) DIVISION

Coxocrural extensors consist of a superficial dual sheet (iliotibialis); an anterior derivative of this; an ambiens; and an extensor iliofibularis.

M. extensor iliotibialis lateralis has origin from the dorsal fascia. The insertion of the cranial part has retreated in *Gallus* and now ends on fascia. The caudal part inserts only slightly on the tibia and mostly upon the surface of the vastus lateralis. Femoral and peroneal nn.

M. extensor iliotibialis anterior (i. internus Gadow) is an anterior derivative of the last, from the dorsal margin of the anterior ilium, inserting medial to the knee. Femoral n.

M. ambiens arises from the spine of the pubis, develops a slender tendon that passes deep to the iliotibialis anterior, then lateralward deep to the patellar tendon, and is inserted in the complicated manner characteristic of birds. It is undeveloped in many genera. Femoral n.

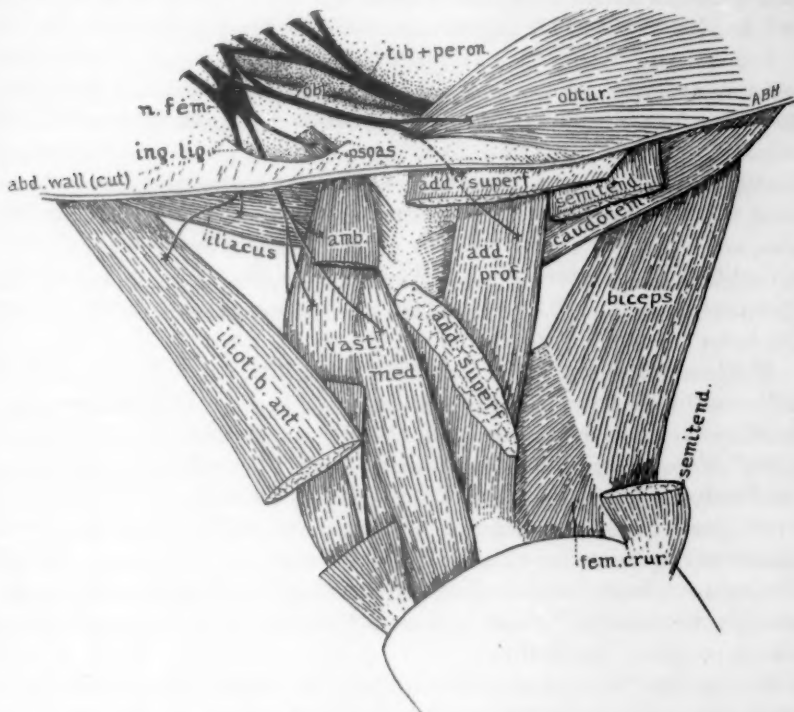


TEXT-FIG. 1.—Lateral view of right hip and thigh of *Gallus*, with some of the muscles cut to show deeper details.

M. extensor iliofibularis (biceps femoris Hudson).—Origin is from the dorsal border of the entire caudal half of the ilium, deep to iliotibialis lateralis. Insertion is on a marked process of the fibular shaft medial to the lateral gastrocnemius, by a long tendon passing through the usual (in birds) tendinous sling. It is very uniform in birds, and it is interesting that in this class it passes medial to the lateral gastrocnemius, but lateral to that

muscle in mammals. In other words, in one class this head has developed and extended lateral to the iliofibularis, as well as to the peroneal nerve, while in the other class (and in Reptilia) it passes medial to both. Peroneal n.

As in reptiles, the more cranial part of the lateral iliotibialis (peroneal n.) is a gluteus superficialis, and is homologous with the mammalian gluteus longus (femorococcygeus) and gluteus maximus. The more cranial part



TEXT-FIG. 2.—Medial view of right hip and thigh of *Gallus*, with abdominal wall cut close to pelvis to show lumbosacral plexus and origins of neighboring muscles.

(femoral n.) and the anterior iliotibial division together are equivalent to the sartorius element. Whether both are represented by the mammalian sartorius or which one, is impossible to say. The evidence indicates that the anterior iliotibial has split off from the lateral sheet; hence in birds there is no long extensor unit that could represent a part of the vastus lateralis that migrated over the hip joint to become a two-joint extensor, and accordingly in this class the rectus femoris is undeveloped.

It is characteristic of the ambiens that it arises medial to the iliacus and accordingly is associated with the vastus medialis, from which it is believed

to have been derived by proximal migration of its origin, as the rectus femoris of tetrapods was formed from the vastus lateralis. The element is present in reptiles (*Iguana*) and absent in mammals. Why birds developed such a tortuous insertion of this muscle is unknown.

The extensor iliofibularis appears to constitute a layer that has split from the deep surface of the caudal (peroneal n.) part of the lateral iliotibialis. It is about as far removed from relationship with biceps femoris as could well be, but is the avian representative of the tenuissimus of mammals.

Femorocrural extensor (femoritibialis Gadow, Hudson) comprises a *vastus lateralis*, and a *vastus medialis* that occurs in two divisions. Evidently developed from a single mass, origins of the two parts have separated and migrated proximally, the lateralis to the base of the greater trochanter and the latter to the medial neck of the femur between iliacus and psoas. There is no part of the vasti in this situation in mammals, and accordingly this part, and its derivative, the ambiens, are undeveloped in that class.

Coxofemoral extensors occur in prozonal (femoral n.) and metazonal (peroneal n.) parts. The former comprises iliacus and psoas elements, and the latter the other gluteal units mentioned.

M. iliacus (iliotrochantericus anterior Gadow, Hudson).—The term iliacus is permissible for this muscle as there appears to be no doubt of its homology. In *Gallus* it arises ventrolateral to the gluteus profundus from the more lateral part of the gluteal fossa of the ilium, and inserts distal to the greater trochanter, between the origins of the two vasti. Femoral n.

M. psoas (iliofemoralis internus Gadow, iliacus Hudson) is a very small muscle arising from the ventral surface of the pelvis. It emerges with the femoral nerve from the abdominal cavity beneath the "inguinal ligament" and inserts upon the "lesser trochanter" just caudal to the origin of the vastus medialis. Femoral n.

The avian "iliotrochanterici" (gluteus profundus, iliacus, psoas) of Gadow are variable in the number and arrangement of the slips. The gluteus and iliacus can be identified on the basis of innervation, while the psoas has a diagnostic origin.

It is noteworthy that in *Gallus*, and apparently generally in birds, the insertions of iliacus and psoas are separated by the origin of the vastus medialis, which undoubtedly has secondarily migrated proximally to this position, rather than caudal (or medial) to both, as in *Iguana*. This need occasion no surprise, however. The bellies of the muscles are widely separated, doubtless because of the exigencies of avian specialization. Both are innervated by the femoral nerve, and the anterior unit, arising from a situation comparable to that in many mammals, clearly is to be identified as an iliacus, while the posterior one must be comparable to the unit termed psoas major, at least, in mammals.

M. gluteus profundus (iliotrochantericus posterior Gadow, Hudson).—This is a single mass, from the gluteal fossa of the ilium, inserting upon the cranial border of the greater trochanter. Deep (anterior) gluteal branches of peroneal n.

M. piriformis (iliofemoralis externus Gadow, *gluteus medius et minimus* Hudson) is absent in many birds. In *Gallus* it is a narrow, partly tendinous slip from the margin of the ilium dorsal to the acetabulum, inserting upon the dorsal part of the greater trochanter. Branch of the nerve to the *gluteus profundus*.

Gluteus profundus and *piriformis* comprise the same element that gives rise in mammals to *gluteus medius* and *minimus*, *piriformis*, and *tensor fasciae latae*, the units innervated by the superior gluteal nerve. In *Gallus* these two glutei are undivided, *tensor fasciae latae* is not developed, and *piriformis* occupies its mammalian position. The last muscle may not be in birds the precise equivalent of that in mammals, but it simulates it closely enough to receive the same name, being a slip obviously separated from the posterior border of the deep gluteal matrix.

VENTRAL (FLEXOR) DIVISION

M. caudofemoralis (caudiliofemoralis Gadow, *piriformis* Hudson).—This muscle has a caudal origin and passes between the two crural flexors to insert upon the femur. It is a representative of the element of the same name in reptiles, and hence is not basically a member of the ventral division of the limb, but has become so, receiving its innervation by a crural flexor branch of the tibial n. Its homologue in mammals is the *presemimembranosus*, at times fused with *adductor magnus*. It has nothing whatever to do with the *piriformis*, a muscle of the dorsal division. It shows great variability in birds.

In amphibians, reptiles, and mammals, a superficial two-joint sheet, dually innervated, split from the medial part of the flexor musculature, giving rise to a puboischiotibial layer in amphibians and reptiles, and to *gracilis* and one of the crural flexors (probably *semimembranosus*) in mammals. In birds it seems that this sheet did not become differentiated, and hence did not develop a two-joint character. Accordingly birds lack a *gracilis* and apparently one of the crural flexors that occur in mammals. Instead they have an adductor mass, occurring in two layers, and two crural flexors, neither of which inserts upon the lateral crus as does the mammalian *biceps femoris*.

Coxocrural flexors, in birds, consist of but two units, as follows:

Flexor cruris medialis (*ischioflexorius* Gadow, *semimembranosus* Hudson) arises from the ischiopubis (partly between the two) lateral to the origin of the *adductor profundus*. Insertion is upon the tibia. It is always present in birds. Crural flexor branches of tibial n.

M. flexor cruris lateralis (caudilioflexorius Gadow, semitendinosus Hudson) arises from the caudal process of the ilium, passes lateral to the caudofemoralis, and inserts chiefly upon a raphe common to this and the femorocruralis, but partly upon the fascia of the medial gastrocnemius. Absent in some birds. Crural flexor branches of tibial n.

As the most medial sheet of the ventral musculature is undeveloped in birds, it is logical to infer, but is not certain, that the most medial,—semimembranosus,—is the crural flexor that is lacking in Aves. The flexor cruris medialis should then be equivalent to semitendinosus and the lateralis to biceps femoris of mammals. The basis of the latter interpretation is not only topography in general, but the fact that it connects by a raphe with the femorocruralis, which will be further discussed under the last-named muscle. Both of these crural flexors represent the caudal (tibial n.) part of the adductor mass and have split therefrom at some stage of their phylogeny. The fact that the more lateral is lateral to the caudofemoralis and that the latter muscle is also lateral to the adductor mass, probably means merely that this crural flexor had already become differentiated at the time that the caudofemoralis migrated to a femoral insertion via a fascial plane.

Coxofemoral flexors comprise two layers of adductors (pubo-ischiofemoralis Gadow), obturator, and two layers of short tibial flexors.

M. adductor superficialis (pubo-ischiofemoralis (part) Gadow, adductor longus Hudson) arises from the pubis (?) and inserts upon most of the femur. Obturator n. No tibial innervation was detected, but if it receive this additional innervation (as in *Iguana*) it would not be unexpected, this then indicating that crural flexor fibers had remained fused with it.

M. adductor profundus, deep to the last (pubo-ischiofemoralis (part) Gadow, adductor brevis Hudson), arises from the ischiopubis (perhaps only one element, but I could not be certain) and inserts upon most of the femur. The two adductors, occasionally fused, seem largely uniform in birds. Obturator n.

M. obturator (part with tendinous insertion, obturator internus Hudson; part with fleshy insertion, obturator externus Hudson) arises from within the pelvis over a broad area, passes through the obturator foramen, and inserts by a large round tendon, accompanied by a few muscle fibers, upon the caudal aspect of the greater trochanter, passing around the caudal aspect of the bone. It is uniformly present in Aves. Obturator n. to the fleshy belly.

The adductor superficialis, superficial to the terminal part of the obturator nerve, is the homologue of the pectineus and adductor longus of mammals. The deep adductor is the equivalent of the mammalian adductores brevis et magnus. In origin the obturator is somewhat suggestive of the mammalian obturator internus, for which it has uniformly been mistaken.

That the latter interpretation is incorrect, however, is attested by the facts that it receives twigs of n. obturatorius within the pelvis, passes *through* the obturator foramen rather than dorsal to the border of the ischium, and it is segregated from any muscle with tibial innervation. Insertion has shifted only to a slight and unimportant degree as compared with that of the mammalian obturator externus, and beyond question it is the equivalent of that muscle. The stimulus for a longer muscle, has been the same, resulting in the extension of origin to within the pelvis of the externus in birds and the internus in mammals, but the obturator internus is an extension of a part of the gemellus mass and this does not occur in any vertebrate class but Mammalia.

The short tibial flexors of the hip comprise a superficial *flexor iliofemoralis* and directly deep to it a thicker *flexor ischiofemoralis* of equal extent, the names of which indicate the origin. Both insert upon the caudal aspect of the greater trochanter, the former fleshily and the latter by a broad tendon. Both are innervated by twigs accompanying the crural flexor nerves, from the tibial, but the nerves to the crural flexors pass between the two. Hence the iliofemoralis is superficial (lateral) to these nerves. There is no mammalian muscle with the same characteristic. It seems to be a peculiar and unique development in birds,—a thin sheet of muscle that has extended along a fascial plane. It *could* have developed from either the caudofemoralis or the ischiofemoralis (there appears no other source from which it could come), but why, in either case, it should pass lateral to the nerves is difficult to understand. I have no convictions in this regard based on my own work, but Romer's (1927) embryological evidence seems to place it with the caudofemoralis, and I follow this allocation tentatively.

The ischiofemoralis element represents the tibial flexors of the hip in mammals,—quadratus femoris and the gemellus mass (with its undifferentiated obturator internus).

Femorocrural flexors consist of but one unit,—*m. femorocruralis* (accessorii m. obturator Gadow, accessorius semitendinosi Hudson). It appears to be extremely variable in birds and often appears to be unrepresented, but in *Gallus* it passes from the distal half of the shaft of the femur to the raphe that it shares with the more lateral crural flexor, while its more distal fibers continue to the fascia of the medial gastrocnemius, in fact almost merging with that muscle. Tibial n. Gadow gave the innervation as a fine twig of n. obturatorius. I sought such innervation without success on six limbs of *Gallus*. The innervation is by the most filamentous of twigs of n. tibialis, diverging from the main nerve in the middle of the thigh. They were almost too fine to determine grossly, and verification was secured by faradic stimulation of the nerves on two live fowls under anaesthetic.

Homologies of muscles of hip and thigh in Iguana, Mammalia, and Gallus

(F) indicates innervation by the femoral nerve; (O) by the obturator (both proximal); (P) by the peroneal; and (T) by the tibial nerve (both metatarsal).

	<i>Iguana</i>	<i>Mammalia</i>	<i>Gallus</i>
Caudofem.	caudofemoralis (2)	caudofemoralis	{ caudofemoralis —(iliofemoralis?) undeveloped
	{ undeveloped (F) pubotib. anter. (F) pubotib. med. c. prof. (F) pubotib. med. c. superf.	{ (F) rectus femoris undeveloped (sart. accessor. ?)	{ undeveloped (F) ambiens (F) sartorius
Coxocrural extensors	{ (F-P) iliotibialis (P) iliofibularis (F) vastus lateralis	{ (F) sartorius (P) gluteus longus (P) gluteus maximus (P) tenuissimus (F) vasti	{ (F + P) iliotibialis (P) iliofibularis (F) vastus lat- eralis
Femorocrural extensors	{ (F) vastus medialis (P) none	{ (F) undeveloped (P) none	{ (F) vastus medialis (P) none
Coxofemoral extensors	{ (F) pubo-ischiofem. (P) iliofemoralis	{ (F) iliacus (F) psoas (P) gluteus medius (P) gluteus minimus (P) piriformis (P) tensor fasciae fem.	{ (F) iliacus (F) psoas (P) gluteus prof. (P) piriformis undeveloped
Coxocrural flexors	{ (O + T) pubo-ischiotib. (T) flex. cruris	{ (O) gracilis (T) semimembranosus (T) prox. pt. biceps } fem. c. long. } (T) semitendinosus	{ undeveloped undeveloped? (T) flex. cruris lat. ? (T) flex. cruris med. ?
Coxofemoral flexors	{ (O + T) adduc. fem. (O + T) pubo-ischiofem. (T) ischiotroch.	{ (F. sic) pectineus (O) adductor longus (O) adductor magnus (O) adductor brevis (O) obtur. extern. (T) { gemelli obtur. intern. quadratus fem. (T) dist. pt. biceps fem. c. long.	{ (O) adduc. superf. (O) adduc. prof. (T) ischiofem. (T) femorocruris
Femorocrural flexors	unrecognizable		

In the interpretation of this muscle there appear to be but two possibilities: either it is a proximal migration of the medial gastrocnemius, which its conformation seems to suggest, or it represents the femorofibularis of Caudata. The point at which its nerve diverges from n. tibialis, and the fact that in life it is seen to be a "white" muscle, while the gastrocnemius is "red," renders the second hypothesis the more attractive. The difference in insertion in Caudata and *Gallus* is a matter of small importance, for there is abundant evidence that the insertions of the crural flexors at least can shift about over the fascia of the posterior crus to any situation best suited to particular function. Similarly, it is tentatively believed that the same element now forms the distal part of the mammalian biceps, and so it is logical to term as biceps the crural flexor with which it is functionally fused in birds.

It should again be stressed that no claim is made that all the above homologies have been established. Cases of individual muscles have been argued according to the evidence that is available to me, and the homologies that seem most reasonable have been chosen for inclusion in the table, some of them only tentatively. It is hardly possible that every one of them will stand the test of time.

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NEST PARASITISM OF HAWKS

BY WILLIAM DUNLAP SARGENT

A VERY high percentage of infection by maggots of *Protocalliphora splendida sialis* Shannon and Dobrosky was found in the nests of the soaring hawks of the family Accipitriidae near Ithaca, New York, during the past two years (1935-36). *Protocalliphora* is a member of the family Calliphoridae, or blowflies, and is a relative of the fleshflies which are raised to feed to fishes and grouse. It was first mentioned in 'The Auk' by Henshaw in 1908. Since then it has been reported in California by Plath in 1919; at Cornell University by Coutant in 1915; again at Cornell by Shannon and Dobrosky in 1924; near Washington, D. C., by McAtee in 1927 and 1929; and in New England by Johnson from 1925 to 1932.

Plath, Coutant, and others report it as killing or crippling songbird nestlings, particularly Bluebirds and finches. In central New York it is an exceedingly common parasite in the nests of the soaring hawks. I have taken it in great numbers from both old and new nests of Red-tailed, Red-shouldered, and Cooper's Hawks in 1935 and 1936, but have failed to find it in nests of Marsh, Sharp-shinned, and Duck Hawks. The Marsh and Duck Hawk nests are probably not suited to it. The Sharp-shinned Hawk's nest examined was a new one without a damply matted interior. Had it possessed such an interior the maggots would probably have been found there. The Red-tailed and Red-shouldered Hawks are new host records, I believe. The Cooper's Hawk was reported as a host by Shannon and Dobrosky in 1924.

The insect is a blood-sucking parasite. Plath reports it attacking the feet, eyelids and crowns of songbird nestlings. In the Cooper's Hawks observed, the blood was obtained from the feather sheaths of the crown and nape, and probably from the feet. The nest examined contained five nestlings. Three of these vanished before they were feathered. This nest was most heavily infested and attacks of the maggots may have driven the young hawks from it. Such attacks have been observed to drive songbird nestlings from their nests.

The maggots enter the ear cavities and attack the feather sheaths of the crowns and napes of large hawks, but the feet do not seem to be attacked. Perhaps the skin is so thick here that they cannot pierce it. Ten maggots were removed from the right ear and nine from the left of a female Red-tailed Hawk reared in 1935. Ten more were found on her crown and nape, and the nest from which she was taken was crawling with them. Each maggot in the ears was as large as a mature housefly maggot and gray in color. The mass of their bodies crowded in the ear openings stretched these

to twice their normal size. The ear openings were completely plugged by the caudal ends of the maggots. This condition appears to be usual in well-grown nestling Red-tailed and Red-shouldered Hawks.

The maggots taken from the crown and nape at first seemed to be under the skin. Investigation proved that this apparent skin surface was an incrustation of down, blood and fecal waste caused by the maggots. The skin was not pierced. Apparently the blood was taken from the feather sheaths.

Three Red-tailed, three Red-shouldered and two Cooper's Hawks, all parasitized by the maggots were reared. No ill consequence of the parasitism was observed. Signs of irritation were not shown by these hawks. None of them showed any indications of deafness. The feathering of the crowns and napes developed normally. The feathering of the crown and nape of the female Red-tail already mentioned was, if anything, excessive. The two Cooper's Hawks, both males, were a bit small, weighing only about a pound each, but the female Red-tail, the most heavily infested of all, grew into a large bird, weighing over three and one-quarter pounds. This lack of injury to young hawks is in contradiction to the observations made upon songbird nestlings by others, with the exception of McAtee. Finding the maggots in the ear cavities is a new observation, I believe. It occurs only in the large *Buteos*. The ears of the small hawks and of the songbirds are probably too small for the maggots to enter. They prefer dampness and darkness, living in the interiors of the nests in the day and crawling out at night to feed. Birds that build well-ventilated nests, or no nests, are not infested. Duck Hawks appear to escape for this reason. It is possible that Duck Hawks might support as many maggots as could be sheltered in their ears, but such infestations have not been observed, and seem unlikely because of the lack of suitable places for pupation on the dry ledges where these hawks nest.

Pupation takes place in the damp interior of the nest, from the bottom of which the adult flies emerge. Mr. Hallock of the Cornell University Entomology Department, who reared the maggots collected in 1936, said that most calliphorid pupae would die in such wet situations. *Protocalliphora* pupae die if dried too soon. This observation agrees with those of Plath and Johnson and disagrees with Coutant's, who based his conclusions on insufficient evidence.

The adults resemble dull-colored bluebottle flies. A few were collected while feeding young Red-shouldered Hawks a dead chicken. The liver, which Red-shoulders will not eat, fell to the ground. A number of flesh-flies, *Lucilia*, collected on it. Associated with them were a few *Protocalliphora* and *Phormia* flies, noticeable by their different color and method of holding their wings. These flies have been supposed to be uncommon

because they are uncommon where insects are usually collected. If collections of birds' nests are made, large numbers of *Protocalliphora* usually emerge from them and they are a common inhabitant of bird houses.

My observations lead me to believe that the infestation of Red-tailed and Red-shouldered Hawks' nests is nearly one hundred per cent. Plath records a sixty-one per cent average for songbird nests in California in 1918. In these infested nests ten per cent of the nestlings died and all were crippled or weakened. In 1931, Johnson (1932) reports a weakening of nestlings in infested nests in New England, causing a lessened resistance to adverse weather. McAtee, in 1929, is the only one who reports songbird infestations without injury to the nestlings. The majority of the evidence, then, at the present time indicates abnormal host-parasite relations in the songbirds.

Contrasted with this, the large hawks, having probably one hundred per cent infection, are neither killed nor weakened under ordinary conditions. These are normal host-parasite relations and would seem to indicate that the soaring hawks, or Buteoninae, are a normal host of *Protocalliphora* maggots.

LITERATURE CITED

COUTANT, ALBERT F.

1915. The habits, life history, and structure of a blood-sucking muscid larva (*Protocalliphora azurea*). Journ. Parasitol., 1: 135-150, 7 figs.

HENSHAW, HENRY W.

1908. A parasitic fly injurious to our native birds. Auk, 25: 87-88.

JOHNSON, CHARLES W.

1925. Insects that infest birds. Bull. Northeastern Bird-banding Assn, 1: 51 (bis)-53.
1927. The infestation of Bluebirds' nests by *Protocalliphora*. Bull. Northeastern Bird-banding Assn, 3: 1-3.
1929. The injury to nestling birds by the larvae of *Protocalliphora*. Ann. Entomol. Soc. Amer., 22: 131-135.
1932. Notes on *Protocalliphora* during the summer of 1931. Bird-banding, 3: 26-29.

MCATEE, W. L.

1927. Notes on insect inhabitants of bird houses. Proc. Entomol. Soc. Washington, 29: 87-93. (With Malloch, J. R., Description of a new genus and three new species of Diptera.)
1929. Further notes on insect inhabitants of bird houses. Proc. Entomol. Soc. Washington, 31: 105-111.

PLATH, O. E.

1919. Parasitism of nestling birds by fly larvae. Condor, 21: 30-38.

SHANNON, RAYMOND C., AND DOBROSKY, IRENE D.

1924. The North American bird parasites of the genus *Protocalliphora* (Calliphoridae, Diptera). Journ. Washington Acad. Sci., 14: 247-253.

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THE SOUTHERN DOVEKIE FLIGHT OF 1936

BY ALEXANDER SPRUNT, JR.

DURING the early winter of 1936-37, and apparently mainly in December 1936, there occurred a marked southern movement of Dovekies (*Alle alle*). While not comparable to the great invasion of 1932, it nevertheless assumed considerable proportions, running into "thousands" of birds. Certainly it was considerable enough to have attracted far more attention than it did, but the almost total lack of comment on it may be explained by the fact that a large percentage of the flight passed at sea. However, many birds did appear in Florida and since they occurred at a time when Florida is full of visitors, it seems passing strange that so few saw the invaders. Dovekies in Florida have not yet reached that degree of abundance which would cause one to pass them by as "just another bird on the list" but it would seem that few noted this remarkable flight except the people who could not well help it.

Studying the records which he has been able to gather, the writer has reached the conclusion that the flight followed over the ocean from the region of Cape Hatteras in North Carolina to a little north of Daytona Beach, Florida. Examining a map of the South Atlantic coast, one will note that there is a great bight formed along the Carolina coasts south of Hatteras, curving out again south of Jacksonville, Florida. The birds probably struck south from a departure in North Carolina and made the next landfall in northern Florida. This would account for the complete lack of records from South Carolina and Georgia; but south of Daytona Beach, the coast follows a fairly straight line down to Miami, and all along this route and curving westward into the Keys, the records are very numerous. It would appear then, that after reaching Volusia County, Florida, the flight followed down the east coast where it can be traced with hardly a break along the towns and cities which lie there. Following the curve of the lower peninsula, the birds hugged the land and travelled down the Keys in some numbers at least as far as Windley Key, which lies just to the eastward of the Matecumbes. There is but one record as far as the writer can gather, which bridged the gap between the Upper and Lower Keys, that of a single bird seen at Key West by W. W. Demerritt, Superintendent of the Seventh Lighthouse District with headquarters at Key West.

A glance at the following records will illustrate the above comments. For the North Carolina records, the writer is indebted to Professor H. H. Brimley, Director of the North Carolina State Museum at Raleigh, and Edwin L. Green, Jr., of the National Park Service. The former stated that one Dovekie was received in the flesh at the Marine Biological Laboratory

at Beaufort, and that "several specimens" were observed and reported from Pea Island by George Lay of the U. S. Biological Survey. All these were in December 1936. There do not seem to be any records for the area about Wilmington and Southport but Mr. Green writes:

"On December 3, 1936, a Dovekie was caught on the beach near the Cape Hatteras Lighthouse. The bird was partially covered with oil and could not fly. On December 4, the remains of three more were found between the lighthouse and the Cape point. On December 6, ten were found at the point just outside of the breakers. Daily from then until December 27, several were observed in the surf. Many birds were stranded on the beach and killed by the Herring Gulls. On December 24, at 3 p. m., I counted 75 in a group that was scattered near the point. On December 27, I was in a sailboat all day on Pamlico Sound near Buxton and Avon, North Carolina. The trip covered about thirty-five miles. Three or four birds were close to the boat the entire trip. There must have been several hundred on the Sound at the time. The birds were very abundant at Oregon Inlet on December 29 (this is thirty-five miles north of the Park). They were still in the Inlet on January 4. How long they remained I do not know as I was not able to get back there again. However, two were seen near Cape Hatteras on January 5, 1937." In this connection, it is most interesting that Mr. Green writes me of the recurrence of Dovekies early in the present season. On November 25, 1937, he saw a flock of twelve and on November 26 picked up two male birds near Cape Hatteras Light; both of the latter died a few minutes later. On the next day a bird of the same species was found dead near the same place, as well as five dead ones on November 29.

The Charleston Museum has no record for the South Carolina coast, nor has any field worker whom the writer has interviewed in that State. Ivan R. Tomkins of the U. S. Engineer Corps, stationed in the Savannah River, has no record for the Georgia coast. Should any have occurred in that area, he would have been certain to know of it.

S. A. Grimes, of Jacksonville, Florida, reported a lack of records about the mouth of the St. John's River but as we reach Daytona Beach, the story changes! R. J. Longstreet of that city was more fortunate than the above observers because the birds came ashore in his area. Mr. Longstreet saw birds himself, and gathered the observations of others, combining these into a published statement which appeared in the 'Florida Naturalist' for April 1937, page 66. This is the single instance, as far as the writer knows, of the invasion finding its way into the printed record, other than the writer's note in 'The Auk,' vol. 54, p. 207, which dealt with the lower east coast and the Keys. Mr. Longstreet's article is here quoted in full:

"On December 10th, 1936, I found a living specimen (Dovekie) on the beach near Daytona Beach. I do not know of any other occurrences in the

state until Dec. 24th, when I saw one swimming in the Halifax River. On Christmas Day, I saw five living birds and twenty-four dead ones on a ten mile stretch of beach north of Ponce de Leon Inlet. Mr. W. B. Boardman of Minneapolis, Minn., reported several dead birds on the beach on Dec. 27th, and one living bird found twelve miles north of Daytona Beach [this is the farthest-north record in Florida,—Author]. Mr. W. Williams of New Haven, Conn., reported three Dovekies, two near Titusville on Dec. 24th and one near Melbourne. Miss Clara Bates of Fort Pierce, reported a flock of five flying south on Christmas Day, and several more during the week. Mr. W. W. Demeritt saw a living Dovekie near Key West during this invasion . . . Mr. Homer Townsend of Vero Beach reported four dead and one living Dovekie on Dec. 29th."

It is highly interesting to trace the regular sequence of localities, viz., Daytona Beach—Titusville—Melbourne—Vero Beach—Fort Pierce then in the writer's 'Auk' note, Jupiter Inlet—Miami—Card Sound—Key Largo—Plantation Key. It is worthy of note that at only two spots did the birds come ashore in any numbers on the Florida east coast. George Nelson of the Museum of Comparative Zoology at Cambridge, saw many hundreds at and near Sebastian, which is between Melbourne and Vero and here the birds got as far inland as the flatwoods. The other spot was the area about Jupiter Inlet where Jesse Griffin, of Marco, Florida, saw "thousands" on December 27. These were in the estuaries and sloughs near the coast, as well as up the Loxahatchee River which empties there. His observations were contained in the article in 'The Auk' by the writer, referred to above.

To arrive at a reason for this flight is difficult. There was no marked atmospheric disturbance in the Middle States or south at the time. Early December in the Carolinas was marked by much rainy and foggy weather but no high winds prevailed, nor had they. There was a cold snap about Thanksgiving which resulted in a freeze, the first of the season in the Charleston area, and the last until February 1937. Late December and all of January was summer weather, with the mercury often going to 80° F. and over. In the Keys and southern Florida, it was of course, very warm. The writer has not checked the weather in late November and early December in New England or the northern coasts.

That no Dovekies came ashore in South Carolina or Georgia would indicate that conditions at sea were favorable, and they certainly must have passed at some distance from land. There do not appear to have been a great many starving birds such as characterized the 1932 flight. Those in the surf at Jupiter were "exhausted" but this was probably because of battling with the water. This area seems to mark the end of the large numbers of birds. What became of the "thousands" seen here but which did not appear further south, is pure conjecture. The occurrence in the

Keys was of small flocks, and scattered individuals. These may have run into some hundreds but hardly more than three to five hundred, judging from the available records. It is of course possible that many birds did not make any landfall after leaving North Carolina until they reached the vicinity of Jupiter Inlet which is considerably south of Daytona.

So, while not attempting to explain this invasion, the writer feels that it is of sufficient importance as a southern mass movement to deserve a place in the ornithological record.

Charleston, South Carolina

PHALAROPES OF THE WESTERN LAKE ERIE REGION

BY LOUIS W. CAMPBELL

PUBLISHED records of the occurrence of the three species of phalaropes at the western end of Lake Erie are very few. Early Ohio records are missing entirely since very little ornithological work was done west of Sandusky Bay until after the year 1920. In southern Michigan and Ontario much work was done from 1880 to 1908, after which until 1922, there is a complete absence of records of phalaropes due possibly to a scarcity of observers. Within the past fifteen years, however, so many occurrences of these birds have been reported at the western end of Lake Erie that the data should be summarized and the present status in this district indicated. In this paper the territory covered extends from Sandusky Bay and the "island bridge" of Lake Erie to the St. Clair Flats. My own field work has been confined largely to the vicinity of Toledo, Ohio. My observations and those of my brother, Bernard R. Campbell, were begun in 1926 although neither of us did any collecting until 1933, which explains the absence of specimens taken during earlier observations.

RED PHALAROPE (*Phalaropus fulicarius*)

The Red Phalarope is by far the rarest of the three species. In Ohio, in 1882, James M. Wheaton (1882, p. 467) recorded the species as a rare transient and admitted it to the list of Ohio birds on the authority of R. K. Winslow. In 1903, William L. Dawson (1903, p. 539) wrote: "Rare migrant. No Ohio specimens known to exist in collections." The same year Lynds Jones (1903, p. 226) placed the bird on his hypothetical list because of an absence of specimens. In 1932, Milton B. Trautman (1932, p. 8) listed the Red Phalarope as casual. In Michigan, Wells W. Cooke (1910, p. 15) stated that this phalarope occurred as a rare straggler and Walter B. Barrows in 1912 (p. 165) declared it to be one of the rarest of the waders in Michigan. Instances of capture and sight records are as follows: October 24, 1888, one bird was shot by Ralph Brandreth at the mouth of the Raisin River, Monroe County, Michigan, and reported by Robert B. Lawrence (Auk, 1890, p. 204), who later mounted it. October 25, 1890, Robert B. Lawrence (1890a, p. 372) collected a female at Monroe, Michigan, which at the time of writing was in his collection. Arthur C. Bent (1927, p. 15) repeated the above records. Walter B. Barrows (1912, p. 165) mentioned Lawrence's record of October 25, 1890, and further stated, "a second (sic) specimen taken at Monroe, October 15, 1894, by Mr. Lawrence was kindly presented to the Michigan Agricultural College . . ." He also wrote: "According to McIlwraith, Dr. Garnier saw a flock of six at Mitchell's Bay

near St. Clair in the fall of 1880 and secured one of them (Birds of Ontario, 1894, p. 125)." My only records are: October 12, 1932, two birds were seen at Little Cedar Point, Jerusalem Township, Lucas County, Ohio, by John Stophlet and myself. They were examined at a distance of twenty feet. On November 7, 1936, I saw one in Jerusalem Township, Lucas County, Ohio; and on October 10, 1937, I collected a female on the Maumee River rapids, Waterville Township, Lucas County. The latter specimen has been given to the Ohio State Museum.

WILSON'S PHALAROPE (*Steganopus tricolor*)

Of the occurrence of this species in Ohio, Dr. James M. Wheaton (1882, p. 466) wrote: "Not common spring and fall migrant.—It is a common summer resident in northern Indiana, abundant in northern Illinois and undoubtedly is a not uncommon resident throughout the summer in some localities in northwestern Ohio." William L. Dawson (1903, p. 541) repeated this statement. The same year, however, Lynds Jones (1903, p. 64) wrote: "This phalarope is reported only from Erie County where it is stated it may breed . . . While it may breed in the northwestern part of the state, there is no record of its doing so." Erie County bounds on the east the territory I have covered in this report. No records are given for the western end of Lake Erie. In 1932, Milton B. Trautman (1932, p. 8) listed this form as a very rare migrant.

Walter B. Barrows (1912, p. 168) stated that in Michigan the Wilson's Phalarope is far from common but he gives several records. Of those within our limits, he wrote: "Mr. Saunders records one killed at Mitchell's Bay, St. Clair Flats, in May, 1882 (McIlwraith, Birds of Ontario, 1894, p. 128) and J. Claire Wood (letter, July 28, 1905) says, 'In June 1900, my brother saw one specimen at St. Clair Flats, and Jesse Craven saw a pair there under circumstances that convinced him they were breeding.' May 9, 1906, Mr. J. Claire Wood saw a pair of these phalaropes in Ecorse Township, Wayne County." J. Claire Wood also collected a male and a female, May 19, 1907, in Ecorse Township, Wayne County, Michigan, which are in the University of Michigan Museum. P. A. Taverner (1906, p. 335) reported a female on May 5, 1906, in Ecorse Township, Wayne County, Michigan. Taverner further stated that he collected this specimen May 12. He also wrote (1908a, p. 204) that a few stop south of Detroit in each spring migration and gave a record for May 9, 1908. In 'The Auk' (vol. 25, p. 328, 1908) he reported that this specimen was collected. B. H. Swales and P. A. Taverner (Auk, 24: 140, 1907) reported a female taken in May 1906, at St. Clair Flats by Clarence Conely of Detroit. Of the Wilson's Phalarope, Wells W. Cooke (1910, p. 15) wrote: "Macoun records that a pair nested at Dunnville, Ontario, near the northeastern shore of Lake Erie." Arthur C.

Bent (1927, p. 35) listed this phalarope as breeding on the St. Clair Flats in Michigan and at Dunnville, Ontario. Among his "early dates of spring arrival" he gives "Ann Arbor, April 1; Detroit, May 1." My earliest dates of arrival for the Wilson's Phalarope are April 28, 1932, and April 28, 1934. The April 1 record quoted above is the earliest given for the entire United States and this suggests the possibility of an error.

More recent occurrences are as follows. On September 7, 1925, one bird was seen at Bay Bridge on Sandusky Bay by Milton B. Trautman (1928, p. 41). On July 12, 1931, I saw one in a flooded field near Bono in Jerusalem Township, Lucas County, Ohio. On April 28, 1932, and May 15, one female, and on May 18, two females and one male were seen by Bernard R. Campbell and me at the mouth of Otter Creek, Oregon Township, Lucas County, Ohio. July 23, 1932, I saw an individual along the Maumee River bank in Riverside Park, Toledo, Ohio. May 21, 1933, I found one bird, apparently a male, in a flooded field near Bono, Jerusalem Township, Lucas County, Ohio. On September 3, 1933, two Wilson's Phalaropes were seen in the Little Cedar Point Marsh, Jerusalem Township, Lucas County, Ohio, by Milton B. Trautman (1935, p. 321), Bernard R. Campbell and myself. April 28, 1934, I observed a female in a temporary pond in the Oak Openings, Monclova Township, Lucas County, Ohio. May 24, 1934, I saw a male in the Maumee River rapids, Waterville Township, Lucas County, Ohio. On September 29, 1935, I collected a male on the Maumee River rapids, Waterville Township, Lucas County, Ohio; the skin is in the Ohio State Museum. May 30, 1936, in the Erie Marsh, Erie Township, Monroe County, Michigan, I saw three females and one male. The male was occasionally pursued by all three females and at times a female would perform a short courtship flight. On July 18, 1936, I saw three individuals in Jerusalem Township, Lucas County, Ohio. Apparently two were females and one was a male. The male was collected and given to Ohio State Museum. July 25, 1936, I found one in Erie Marsh, Erie Township, Monroe County, Michigan. I have found no evidence whatever which might indicate that Wilson's Phalarope nests in the area under discussion. The former extensive wet prairies of the Oak Openings west of Toledo which might have been suitable as breeding grounds for the Wilson's Phalarope, have now been drained.

NORTHERN PHALAROPE (*Lobipes lobatus*)

There are no early Ohio records for this phalarope at the western end of Lake Erie. Writing of the entire State of Ohio in 1882, James M. Wheaton (1882, p. 466) called it a "rare spring and fall migrant" and neither Lynds Jones (1903, p. 226) nor William L. Dawson (1903, p. 539) added anything to his statement. More recently, in 1932, Milton B. Trautman (1932, p. 8)

listed the Northern Phalarope as casual. In 1912, Walter B. Barrows (1912, p. 166) stated that this species "is hardly more than a straggler in Michigan . . . McIlwraith quotes Saunders' record of 'one found dead at Mitchell's Bay 1882' (Birds of Ontario, 1894, p. 127). . . I do not know of an actual Michigan specimen preserved anywhere." B. H. Swales (1913, pp. 111-112) in 1913, discussed the status of the species in Michigan, giving one record of a bird taken September 14, 1899, in Lenawee County, Michigan, and now in the U. S. National Museum. Swales also mentioned two specimens now in the collection of W. E. Saunders, of London, Ontario, that were taken by Phillip Burk at Rondeau, Ontario. One of these specimens was secured on October 10, 1906, and the other on October 20, 1906. In addition to these, another Michigan record not in our territory was given. In 1927, Arthur C. Bent (1927, p. 28) reported the capture of September 14, 1899, only.

Recent occurrences are as follows. On May 21, 1922, Dr. Frank N. Wilson (1923, pp. 184-185) discovered two Northern Phalaropes on a small pond fifteen miles west of Detroit, Michigan, and succeeded in photographing one. However, when the picture was printed in 'Bird-Lore,' it was titled in error "A Red Phalarope in Michigan." September 13, 1924, Harold S. Peters (Geist, 1928, p. 7) collected a specimen at Bay Point, Ottawa County, Ohio, now in the Ohio State Museum. May 22, 1926, an individual, apparently a female, was seen by Louis A. Klewer and myself (1930, p. 6) in Washington Township, Lucas County, Ohio, in a flooded field. May 30, 1927, I (1930, p. 6) saw a female in the same location. On September 16, 1928, I found two individuals in a marsh near Gypsum, Ottawa County, Ohio. January 1, 1932, a Northern Phalarope was seen by John Stophlet at Little Cedar Point, Jerusalem Township, Lucas County, Ohio. On January 14, 22 and 28, Roger Conant and I watched it for some time. On January 22, the bird was accompanied by a Red-backed Sandpiper (*Pelidna alpina sakhalina*) and on January 28 by three. This phalarope was very tame. Examined within a distance of ten feet, it was carefully distinguished from the Red Phalarope. August 21, 1932, I saw one in the Little Cedar Point Marsh, Jerusalem Township, Lucas County, Ohio. September 4, 1932, I found one at Little Cedar Point, Jerusalem Township, Lucas County, Ohio. On September 3, 1933, a group of three was seen by Milton B. Trautman (1935, p. 321), Bernard R. Campbell and myself in the Little Cedar Point Marsh, Jerusalem Township, Lucas County, Ohio. These accompanied the two Wilson's Phalaropes mentioned previously. May 22, 1934, one was seen on the Maumee River rapids, Waterville Township, Lucas County, Ohio, by John Stophlet. September 9, 1934, two females were collected by Milton B. Trautman at North Cape, Erie Township, Monroe County, Michigan, and given to the University of

Michigan Museum at Ann Arbor. May 7, 1935, Bernard R. Campbell and I found a female in the Erie Marsh, Erie Township, Monroe County, Michigan. This bird was collected by my brother and presented to the University of Michigan Museum. September 15, 1935, I found an individual in the Little Cedar Point Marsh, Jerusalem Township, Lucas County, Ohio. May 30, 1936, I saw three Northern Phalaropes,—two males and one female as far as I could judge by their appearance,—in the Erie Marsh, Erie Township, Monroe County, Michigan. These birds were near the four Wilson's Phalaropes previously mentioned. On August 22, 1936, I collected a male in the Erie Marsh, Erie Township, Monroe County, Michigan; it is now in the University of Michigan Museum. September 27, 1936, I found a group of four on a mud flat near the mouth of the Maumee River in Toledo, Ohio. Of these, a male and a female were collected and are now in the Ohio State Museum. The female weighed 37.9 grams, which is 10.9 grams more than the weight of the male; however, the female had a wing length of only 102.5 mm. against 105 mm. of the male. October 4, 1936, I found one bird still remaining at the above location.

SUMMARY

From the above occurrences I conclude that the status of the three phalaropes at the western end of Lake Erie is as follows: (a) The Red Phalarope is a very rare migrant which has been noted only in the autumn, arriving October 17 (5) and leaving November 7 (1). The extreme migration dates are October 10, 1937, and November 7, 1936. The digit in parenthesis after these and the following averages indicates the number of years upon which the average has been computed. (b) The Wilson's Phalarope is a fairly regular though not numerous transient, slightly more common in the spring than in the autumn, and formerly a rare breeder in Michigan and Ontario. The average arrival and departure dates for spring are May 4 (5) and May 22 (5) with extreme dates of April 28, 1932 and 1934, and May 30, 1936. Fall migration averages July 18 (3) and September 13 (3). Extreme arrival and departure dates are July 12, 1931, and September 29, 1935. I have found nothing which might indicate that the species has bred in the portion of Michigan and Ontario under discussion, since 1900. (c) The Northern Phalarope is a fairly regular but not numerous transient, somewhat more common in autumn than in spring. Arrival and departure averages for spring are May 7 (1) and May 25 (5), with extreme dates of May 7, 1935, and May 30, 1927 and 1936. Fall averages are September 7 (8) and October 12 (2) with extremes of August 21, 1932, and October 20, 1906. There is one occurrence in winter, January 1 to 28, 1932.

I wish to acknowledge my indebtedness and express my thanks to Dr. Josselyn Van Tyne, Curator of Birds, and Milton B. Trautman, Assistant

Curator of Fishes, of the University of Michigan Museum of Zoology for aid and criticism in preparing this article.

REFERENCES CITED

- BARROWS, WALTER B.
1912. Michigan Bird Life. Lansing, Michigan, 822 pp.
- BENT, ARTHUR C.
1927. Life histories of North American shore birds. Bull. U. S. Nat. Mus., no. 142, 420 pp.
- CAMPBELL, LOUIS W.
1930. Check list, birds of Toledo, Ohio, and vicinity. Toledo, Ohio, 19 pp.
- COOKE, WELLS W.
1910. Distribution and migration of North American shorebirds. Bull. U. S. Dept. Agric., Biol. Surv., no. 35, pp. 1-100.
- DAWSON, WILLIAM L.
1903. Birds of Ohio. Columbus, Ohio, 671 pp.
- GEIST, ROBERT M.
1928. The Wheaton Club. Ohio State Mus. Science Bull., 1: no. 1, 5-8.
- JONES, LYND S.
1903. Birds of Ohio. Ohio State Academy, no. 6, 241 pp.
- LAWRENCE, ROBERT B.
1890. The Red Phalarope on Lake Erie. Auk, 7: 204.
1890a. Second occurrence of the Red Phalarope at Monroe, Michigan. Forest and Stream, 25: 372.
- SWALES, B. H.
1913. Northern Phalarope (*Lobipes lobatus*) in Michigan. Auk, 30: 111-112.
- SWALES, B. H., AND TAVERNER, P. A.
1907. Recent ornithological developments in south-eastern Michigan. Auk, 24: 135-148.
- TAVERNER, P. A.
1906. South-eastern Michigan records. Auk, 23: 335.
1908. The year 1908 in south-eastern Michigan. Wilson Bull., 20: 199-208.
1908a. Wilson's Phalarope and White-rumped Sandpiper in Wayne Co., Michigan. Auk, 25: 328.
- TRAUTMAN, MILTON B.
1928. Notes on Ohio shorebirds. Ohio State Mus. Science Bull., 1: 40-44.
1932. Second revised list of Ohio birds. Bull. Ohio Dept. of Conservation, 1: no. 3, 16 pp.
1935. Additional notes on Ohio Birds. Auk, 52: 321-323.
- WHEATON, JAMES M.
1882. Birds of Ohio. Columbus, Ohio, 628 pp.
- WILSON, FRANK N.
1923. The Northern Phalarope in Michigan. Bird-Lore, 25: 184-185.

Toledo, Ohio

NOTES ON TWO NESTS OF THE EASTERN MOURNING DOVE

BY MARGARET MORSE NICE

FROM April 3 to 14, 1928, a pair of *Zenaidura macroura carolinensis* had been noted 'nest-calling' in various trees on our grounds at Columbus, Ohio. On the 17th I found that they had a bulky nest in an apple tree in which I had never heard them nest-calling. I watched them on this date from 10.19 a. m. to 1.34 p. m.; in the three and a quarter hours the male made eighty-two trips with material,—usually a single piece of dead grass,—while his mate remained on the nest. At about a third of the trips he stepped on her back and laid his offering before her, but the rest of the time he merely placed it on the rim. During the first hour he made nineteen trips, during the second thirty-two, and in the third, twenty-one. He worked steadily bringing loads at from one- to three-minute intervals with a single exception of a thirteen-minute recess from 12.54 to 1.07 p. m. At 1.34 p. m., the female flew away and no more work was done that day, nor so far as I know, afterward. The nest was an unusually substantial affair.

The first egg was laid after 5 p. m. on April 19. The next day the male relieved his incubating mate at 9.01 a. m., and on the following day fully an hour later. That afternoon the nest was empty; I suspected a Blue Jay as the culprit.

It was not until 1934 that the opportunity again presented itself of watching doves from the house; this time a pair nested outside my study window. Due to my preoccupation with other birds, it was not possible to keep more than a few notes on their activities; my chief interest was to determine the times at which the birds changed places on the nest, as this was a point on which I had obtained almost no data when studying this species in Oklahoma (Nice, 1922-23).

On April 23 a pair was nest-hunting in a large honey-locust. The male gave the nest-call in a crotch, constantly flipping his wings; his mate came and preened him, then got into the crotch herself and flipped her wings, but gave no note. He preened her and soon was back in the crotch. At noon there were three straws there, but they soon blew away, and the next day much the same thing happened. On the 25th they started to build in earnest, practically finishing the nest the following morning. On the 28th the first egg was laid, and on the 30th the second. Both hatched May 14. Curiously enough, on the 13th the male brought a dozen loads of material to the nest between 6.00 and 6.15 a. m. The young left the nest May 26, but stayed in the home tree for six more days.

Craig (1911) says in regard to this species, "Male and female take regular daily turns in sitting on the eggs or young: the female sits from evening

till morning, the male from morning till evening, the exchanges taking place usually about 8.30 a. m. and 4.30 p. m." Snyder (1923) reports that a pair in Iowa changed "rather regularly between eight and nine o'clock in the morning, and five and six o'clock in the afternoon."

Somewhat to my surprise I found that the time of exchange might vary an hour or more both in the morning and in the afternoon, and this variation had no relation to the clearness or cloudiness of the day. Columbus is on Eastern Standard Time, which is twenty-eight minutes later than sun time. On five mornings during incubation (May 4, 5, 7, 9, 10) the male took his place on the nest at the following times: 10.07, 9.42, 9.29, 9.28, 10.20; on four mornings after the young had hatched (May 17, 20, 22, 23) he did so at 9.15, 9.20, 8.55, 10.19. The average of the first group is 9.54, of the second 9.27, or 9.26 and 8.59 respectively by sun time. The female was never noted as arriving before 5.00 p. m. during incubation; three definite records (May 9, 11, 12) were 5.38, 5.14 and 5.26 p. m. After hatching, the two instances noted came earlier,—4.35 p. m. on May 14, and 4.55 p. m. on May 20. Although the observations are few, they indicate an earlier arrival for both parents after the young hatched than before, an average advance of twenty-seven minutes for the male and nineteen for the female. On May 9 the male incubated from 9.28 a. m. to 5.38 p. m., a period of eight hours and ten minutes; on the 20th he brooded from 9.20 a. m. to 4.55 p. m. or seven hours and thirty-five minutes.

How many times are nestling Mourning Doves fed in a day? Apparently no one knows. Gates (1909) believed they were "not fed more than three times a day, generally but twice and often not more than once." This, however, is an error; from my scattered observations it seems probable to me that the female gives the young pigeon-milk at least twice in the morning, the male feeds them at least four times during his eight-hour session, and the female at least twice in the evening. It would be of interest to watch a dove's nest throughout two whole days, once soon after the young hatched, and again later in their history.

SUMMARY

One pair of Mourning Doves was watched for three and a quarter hours during nest building; in this time the male worked almost without a break, making eighty-two trips with material to the nest. With another pair the male took his turn on the nest at hours ranging from 8.55 to 10.30 in the morning, while the female returned from 4.35 to 5.38 in the afternoon.

REFERENCES CITED

CRAIG, WALLACE.

1911. The expressions of emotion in the pigeons. II. The Mourning Dove (*Zenaidura macroura* Linn.). *The Auk*, **28**: 398-407.

GATES, WM. H.

1909. A few notes on the habits, life history and economic value of doves. *Bull. Gulf Biol. Station, Cameron, La.*, no. 14: 3-27.

NICE, MARGARET M.

- 1922-23. A study of the nesting of Mourning Doves. *The Auk*, **39**: 457-474;
40: 37-58.

SNYDER, L. L.

1923. The Mourning Dove (*Zenaidura macroura carolinensis*) at Panora, Iowa. *The Auk*, **40**: 240-244.

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'ANTING' BY BIRDS

BY W. L. MCATEE

THE German equivalent of the word 'anting' was proposed by E. Stresemann in 1935 (1935b) to cover not only 'bathing' in ant nests or swarms, dressing the plumage with crushed ants, and placing ants among the feathers, but also all apparent substitutes for these actions. In the present writer's opinion the term should be restricted to phenomena involving ants, for the sake of logic, appropriateness, and due conservatism. We scarcely understand any of the matters involved but we can be sure that birds do not put among their feathers active, acid-secreting, and biting and stinging ants for the same purpose as quiescent, bland, and inoffensive snails.

Stresemann's compilations have been commented upon in India (Ali, 1936) and Great Britain (Jourdain, 1935) but not in America, nor have the published American instances been included in any of the prior discussions. They involve three additional species of birds and all are earlier than any of the records for other lands. One of them by Abbott M. Frazar (1876) has considerable priority over any other published observation that has come to notice.

The writer has referred to the matter in two previous publications (1914, 1918) but has never had the good fortune to make a personal observation of 'anting.' His interest was greatly renewed when E. R. Kalmbach had such an opportunity in 1935 and told him about it. Believing that personal experience gives much needed validity to discussions that are necessarily chiefly compiled, he urged Kalmbach to write on the subject and turned over to him all available references. So much of Kalmbach's time was required for extended official field investigations and the preparation of reports upon them that he returned the material to the writer for compilation. The account of his own observation is as follows:

"At Washington, D. C., about 3.00 p. m., November 11, 1935, I observed a small group of Starlings feeding on the lawn to the east of the U. S. National Museum. After watching them for a moment or two, it was noted that they were performing in a most unusual manner. The birds, two to four in number, seemed to be attracted to a particular spot in the lawn, to which they repeatedly returned when flushed.

"They were observed picking up small objects from this circumscribed area about two feet in diameter, and then, standing rather erect, appeared to place these objects beneath their slightly raised wings. The tucking of these objects beneath their wings was a rapid procedure and there was no indication of any preening action. The tip of the bill was placed sometimes on one side and sometimes on the other, at a point near the posterior edge

of the secondaries. I could not detect whether the objects were being deposited on the wing itself or among the feathers on the sides of the rump.

"After watching the performance for as much as three or four minutes, in the course of which the birds were flushed several times by passersby, I went to this area and there found an active colony of ants, specimens from which were later identified as *Lasius interjectus* Mayr, by R. A. Cushman.

"Although no Starlings were collected, it is my conviction that they were picking up these ants and placing them in their plumage as described. There were other Starlings in the same general vicinity but only at this one spot, the site of the ant colony, did the birds perform in the manner described.

"It was later learned that this species of ant is aphidicolous and feeds largely on honey-dew. It is not considered predaceous, a fact that would lessen the validity of the theory that birds place ants in their plumage so they may feed on ectoparasites. I have also been informed that the excretions of this species contain citric rather than formic acid as a principal constituent, a fact that was clearly evident to anyone passing near the irritated colony of ants."

This new observation is the only one cited here in full. Rather than repeat or paraphrase others in the text, they are presented in the form of annotations to the bibliography. This plan enables the reader to learn what each author had to say about anting and cognate phenomena and their biological significance. On analyzing the literature, it is apparent that we have to deal with a variety of observations and with conclusions drawn from them that are almost as numerous as the observations themselves. In arranging these in logical sequence it seems legitimate to begin with the simple use of ant hills as dusting places, as in this action birds only take advantage of a widely available opportunity, and there are no implications as to any extension of the basic principle. By contrast, mere quiet sitting on an ant nest to allow the ants to remove parasites, or for "enjoyment," seems to imply to some degree "knowing what it is all about." Along such lines records of the impressions of observers are here arranged in a series having to do first with anting, then with supposed substitutes, and finally with what has been taken to be intentional transportation of food supplies. (Anting itself has also been interpreted in this sense.)

ANTING

Frequenting ant nests (or swarms)

For dust bathing; no deductions. Wright (1909); Detmers (in Heinroth, 1911b); Ringleben (1935).

For sprinkling with formic acid to expel ectoparasites. Floericke (1911); Heine (1929); Robien (1935).

To permit ants to remove ectoparasites. Frazar (1876).

For enjoyment. Troschütz (1935).

Dressing feathers with ant juices

Supposedly with secretions of ants that are picked up and dropped. Anon. (in Chisholm, 1935).

With crushed ants. Troschütz (1935).

With crushed ants which are then eaten; for external effect—deterrent to ectoparasites; for internal effect—stimulation, or the expelling of endoparasites. Ali (1936).

Dressing feathers with living ants

No deductions. Gengler (1925).

To drive out vermin. Heinroth (1911a); Funke (1912).

For agreeable effect of formic acid. Troschütz (1931).

Placing ants among feathers

No deductions. Detmers (in Heinroth, 1911b); Moncrieff (1935).

To profit by insecticidal action of their secretions. Floericke (1911); Chisholm (1935); Hampe (1935); Kalmbach (in this paper).

As a means of food transportation. Ellicott (1908).

Cognate (?) phenomena, not anting

Dressing feathers with beer, lemon flesh, lemon juice, orange juice, vinegar. Hampe (1935).

Dressing feathers with cigar stumps. Heinroth (1911a).

Dressing feathers with amphipods. Braun (1924).

Dressing feathers with mealworms. Neunzig (in Heinroth, 1911b).

Placing "insects" among feathers

For enjoyment of their crawling about. Kleinschmidt (1935).

As a means of food transportation. Anon. (in Moncrieff, 1935).

Having snails among feathers during migration

No deductions. Ramsden (1914).

As a food supply. Beyer (in McAtee, 1914).

As to the purport of anting and other behavior here noted, it is manifest that we have to do largely with inferences. Observations of fact are those of Frazar (1876) who states that ants were seen to seize parasites and bear them away; of Abdulali (in Ali, 1936) who observed that the ants were eaten; and of Beyer (in McAtee, 1914) who reports finding the same kind of snails in the stomachs of newly arrived migrants as were carried among their feathers. A trait of ants stressed by McAtee (1918) but not mentioned by any of the other writers here cited, is their tendency, when disturbed, to seize upon the nearest available object with the jaws in a grip so persistent that often the insect dies without relaxing it. So far as it goes, this fact gives support to the food-transportation hypothesis, which seems far more than a hypothesis in the Beyer observation. The phenomena involved in anting and the other actions of birds here noted are both remarkable and obscure, and whether we shall ever understand their exact significance is doubtful.

A list follows of the birds thus far observed to share in true 'anting.' All are Passeres; the absence of woodpeckers (outside of that order) is notable as these birds are rather closely associated with ants and feed freely upon

them. The argument might be advanced that woodpeckers, as a result of their diet, may be reeking with ant secretions and thus obtain whatever advantages there may be in that state, but the same argument should apply in the case of thrushes, also hearty consumers of ants, but which are reported as quite prone to anting.

CORVIDAE

Corvus corone
Corvus cornix
Corvus brachyrhynchos
Pica pica
Garrulus glandarius
Cyanocitta cristata

TIMELIIDAE

Leiothrix lutea
Lioptila capistrata
Chloropsis jerdoni
Chloropsis sp.

CINCLIDAE

Cinclus cinclus

TURDIDAE

Turdus musicus
Turdus iliacus

STURNIDAE

Sturnus vulgaris
Acridotheres tristis

COMPSOTHTYPIDAE

Vermivora pinus

ABSTRACTS OF LITERATURE CITED

ALI, SALIM

1936. Do birds employ ants to rid themselves of ectoparasites? Journ. Bombay Nat. Hist. Soc., 38(3), April, pp. 628-631.

Record by Humayun Abdulali of *Chloropsis jerdoni* crushing ants (*Oecophylla smaragdina*) and rubbing them into the tail feathers before eating them. Review of the cases of anting compiled by Stresemann (1935a, b). [Comment]: Protective-adaptation theorists would say that the *Chloropsis* was doing away with some of the formic acid, which taken internally would be harmful to the birds. Ali notes, however, that this acid is used in human medication "to give tone to the muscles, increase muscular energy, and abolish the sense of fatigue," and may be similarly useful to birds, or possibly also in expelling endoparasites.

BRAUN, HANS

1924. Aus der Vogelstube. Verh. Ornith. Gesell. Bayern, 16(1), June, p. 43.

A Dipper (*Cinclus c. meridionalis*) reared in captivity was many times observed to take an amphipod in its bill and rub it in its wing feathers.

CHISHOLM, ALEC H.

1935. Bird wonders of Australia, pp. 153-155.

Report of one observer that Starlings place ants under their wings, of another that "starlings, jays, etc." do the same "and after a while take them out again," and of a third that Indian Mynas in Australia pick up ants, shake and drop them, and wipe their bills beneath their wings. The compiler concludes that these acts have relation to parasites and that the birds "must be able to discriminate between the stinging and the spraying types of ants."

[DRAKE, JOHN N.]

1889. [Parasites among woodpecker feathers (Proc. Linn. Soc. N. Y., Nov. 30, 1888).] The Auk, 6(2), April, p. 198.

Drake mentioned finding parasites resembling grains of rice among the

feathers of eight specimens of Red-headed Woodpeckers taken by him in Sullivan Co., New York. Query: Could these have been ant pupae? The description fits so far as it goes. This observation is not further referred to in the present paper.

ELLICOTT, GRACE

1908. Note on the food of Blue Jay. *Guide to Nature*, 1(5), August, p. 168.
A Blue Jay at Newcastle, Indiana, observed to seize numerous ants and deposit them among the feathers back of and underneath the wings, possibly by way of food transportation.

FLOERICKE, K.

1911. Eine merkwürdige Beobachtung an Staren. *Mitteilungen über die Vogelwelt*, p. 219 (reference from Gerber, 1935).
A pair of Starlings fairly buried themselves in an ant nest, and threw the ants over their feathers with every sign of enjoyment. The birds were also seen to use the beak in placing ants under the feathers where the action of the formic acid would be effective.

FRAZAR, ABBOTT M.

1876. Intelligence of a Crow. *Bull. Nuttall Ornith. Club*, 1(2), July, p. 76.
A tame Crow "deliberately takes his stand upon an ant-mound and permits the ants to crawl over him and carry away the troublesome vermin." Ants seen to seize the parasites and bear them away.

FUNKE, DR.

1912. [Magpie anting.] *Mitteilungen über die Vogelwelt*, p. 16 (reference from Gerber, 1935).
A tame Magpie was often observed, after its morning bath, to take several ants in its bill and stroke the feathers beneath the wing and on the rump. The behavior of this bird as well as that recorded for the Starling seems to indicate, not so much enjoyment of the skin-prickling sensation and the strong 'perfuming', or a certain esthetic requirement, but rather the practical objective of driving out annoying vermin by means of the formic acid.

GEBHARDT, E.

1935. [Quotation from Gengler, 1925, q. v.] *Ornith. Monatsber.*, 43(5), Sept.-Oct., pp. 135-136.
No original remarks.

GENGLER, J.

1925. *Die Vogelwelt Mittelfrankens. Verh. Ornith. Gesell. Bayern*, 16 (Sonderheft), p. 359.
Starlings in an aviary repeatedly took in their beaks from an ant nest given them, one to several ants at a time and passed them through the wing and back feathers as if to besmear or anoint them. Other insects were not observed to be so used.

GERBER, ROBERT

1935. [Quotations from Floericke, 1911, and Funke, 1912, q. v.] *Ornith. Monatsber.*, 43(5), Sept.-Oct., p. 135.
No original remarks.

HAMPE, HELMUT

1935. [Starlings anting; Starlings and jays liking acid baths.] *Ornith. Monatsber.*, 43(5), Sept.-Oct., pp. 137-138.
Starlings "artificially" reared, inserted ants among the feathers at every

opportunity. Also they eagerly dressed their feathers with lemon flesh, lemon juice, vinegar and beer. They were always keen to find a vessel in which salad had been prepared with vinegar and to bathe in it. A tame jay behaved similarly; every time an orange was peeled this bird came near to intercept the spurting sap, at the same time going through the motions of bathing.

HEINE, H.

1929. Krahen benutzen Ameisen zum Vertreiben von Auszen-parasiten. Ornith. Monatsber., **37**(6), Nov.-Dec., pp. 188-189.
Hooded Crows dusting in a colony of *Formica rufa*; the ant hill was torn apart and the place smelled strongly of formic acid. Assumes that the crows sprinkled themselves with formic acid to rid themselves of parasites. The action is not to be explained as instinctive but rather as the result of experience.

HEINROTH, O.

- 1911a. Deutsche Ornithologische Gesellschaft, Bericht über die November-sitzung 1910. Journ. f. Ornith., **59**, p. 172.
A tame Magpie eagerly rubbed its feathers with cigar stumps. Starlings do the same with living ants. A young Dipper, at its first experience with ants, seized one after another in its beak and passed them through its wing, back and leg feathers. Birds probably find the formic acid useful in expelling vermin, but as an inexperienced young bird, free of parasites, was observed anting, the action seems to be purely instinctive.

HEINROTH, O.

- 1911b. Deutsche Ornithologische Gesellschaft, Bericht über Dezember-sitzung 1910. Journ. f. Ornith., **59**, pp. 350-351.
Herr Detmers remarked that he had observed crows not only inserting ants among their feathers but also dusting in ant hills. Herr Neunzig had seen *Leiothrix* and different species of *Garrulax* rub their feathers with mealworms.

JOURDAIN, F. C. R.

1935. Miscellanea ornithologica et oologica. The use of living ants by birds against parasites. Oologists' Record, **15**(4), December, p. 79.
Abstract of articles by E. Stresemann (1935a, b).

KLEINSCHMIDT, O.

1935. [Quotations from Heinroth, 1911a, 1911b, q. v.] Ornith. Monatsber., **43**(5), Sept.-Oct., p. 134.
Asks whether birds enjoy the crawling of the insects in the feathers as the crow does twiddling of the fingers in its neck feathers.

McATEE, W. L.

1914. Birds transporting food supplies. The Auk, **36**(3), July, pp. 404-405.
Refers to the Ellicott and Ramsden notes (q. v.) and quotes from a letter by G. E. Beyer on the finding of numerous small snails of the genus *Physa* under the wings and also in the stomachs of newly arrived migrant Upland Plovers.

McATEE, W. L.

1918. The biting powers of ants. Amer. Mus. Journ., **18**(2), February, pp. 141-147, 1 pl.
Cites the Ellicott case (q. v.).

MONCRIEFF, PERRINE

1935. Relation of birds and insects. The Emu, 34(3), January, p. 248.

The behaviour of Starlings in placing ants under their wings has been known to him for years, and he was told by an English observer that birds of this species in autumn store insects under their wings in order, according to the observer's belief, to have food with them during migration.

RAMSDEN, CHAS. T.

1914. The Bobolink (*Dolichonyx oryzivorus*) as a conveyer of Mollusca. The Auk, 36(2), April, p. 250.

As an unusual occurrence, spring migrants, which, as a rule, pass over, stopped at Guantanamo, Cuba. Live mollusks found among the feathers of some of the birds collected were *Succinea riisei* known from St. Croix and Puerto Rico but not from Cuba.

RINGLEBEN, HERBERT

1935. [Various birds anting; quotation from Troschütz, q. v.] Ornith. Monatsber., 43(5), Sept.-Oct., p. 136.

As often as it had opportunity, a tame Carrion Crow 'bathed' in ant hills thoroughly and with evident pleasure. One 'bath' continued 25 minutes after which the bird was for some time obviously weary. Similar observations were made on *Chloropsis* species and on the Song Thrush and Red-wing Thrush in the aviary of A. Troschütz.

ROBIEN, PAUL

1935. [Jays anting.] Ornith. Monatsber., 43(5), Sept.-Oct., p. 137.

Two tame but free flying *Garrulus glandarius* took ant baths whenever an ant nest was laid bare in farm work. By treading on the place the ants were greatly excited and their spurtings copiously showered the feathers of the birds. The jays continued turning about and even wallowing, up to fifteen minutes at a time. Often they erected the tail and sat down, only the next moment to be turning on the shoulder. Ants that crawled up were thrown off. After the acid bath the jays flew away and shook and preened themselves as after a water bath.

STRESEMANN, E.

- 1935a. Werden Ameisen durch Vögel zum Vertreiben von Auszenparasiten venützt? Ornith. Monatsber., 43(4), July-Aug., pp. 114-115.

Calls attention to Chisholm's Starling record (q. v.) and Heine's note of 1929 and asks for records of other observations.

STRESEMANN, E.

- 1935b. Die Benutzung von Ameisen zur Gefiederpflege. Ornith. Monatsber., 43(5), Sept.-Oct., pp. 134-138.

Review of published notes and observations (separately cited in the present bibliography) and conclusions of the compiler. Birds of several families are known at times to react similarly to the presence of ants; sometimes they react in much the same way also to substitutes of suggestively similar form or possessing acid juices. So widespread a phenomenon must have biological significance and the reasonable conclusion is that it is for relief from external parasites. Research probably will clarify the matter. A term is proposed for the behavior which may be anglicised as 'anting'.

TROSCHÜTZ, ALFRED

1931. Bunte Bilder aus der Vogelstube. Die gefiederte Welt, 60(41), Oct. 8, p. 484.

A peculiarity which certain exotic birds and the Redwing Thrush have in common is the use of living ants for anointing the legs, rump, and wings. This is done with amazing devotion, eagerness, and persistence. The formic acid must have an especially agreeable effect.

TROSCHÜTZ, ALFRED

1935. [Various birds anting.] Ornith. Monatsber., 43(5), Sept.-Oct., p. 137.
Leiothrix lutea, *Lioptila capistrata*, Redwing Thrush, and Song Thrush seize living ants, crush them in the beak and rub them on their legs; on the rump also by the Song Thrush. The Redwing stationed itself among the swarming ants and apparently enjoyed so doing.

WRIGHT, HORACE W.

1909. A nesting of the Blue-winged Warbler in Massachusetts. The Auk, 26 (4), October, pp. 337-345.
The warbler observed taking a dust bath in a "black ant hill" (p. 340).

U. S. Biological Survey

Washington, D. C.

JACQUES LE MOYNE, FIRST ZOOLOGICAL ARTIST IN
AMERICA

BY ELSA G. ALLEN, PH.D.

Plate 6

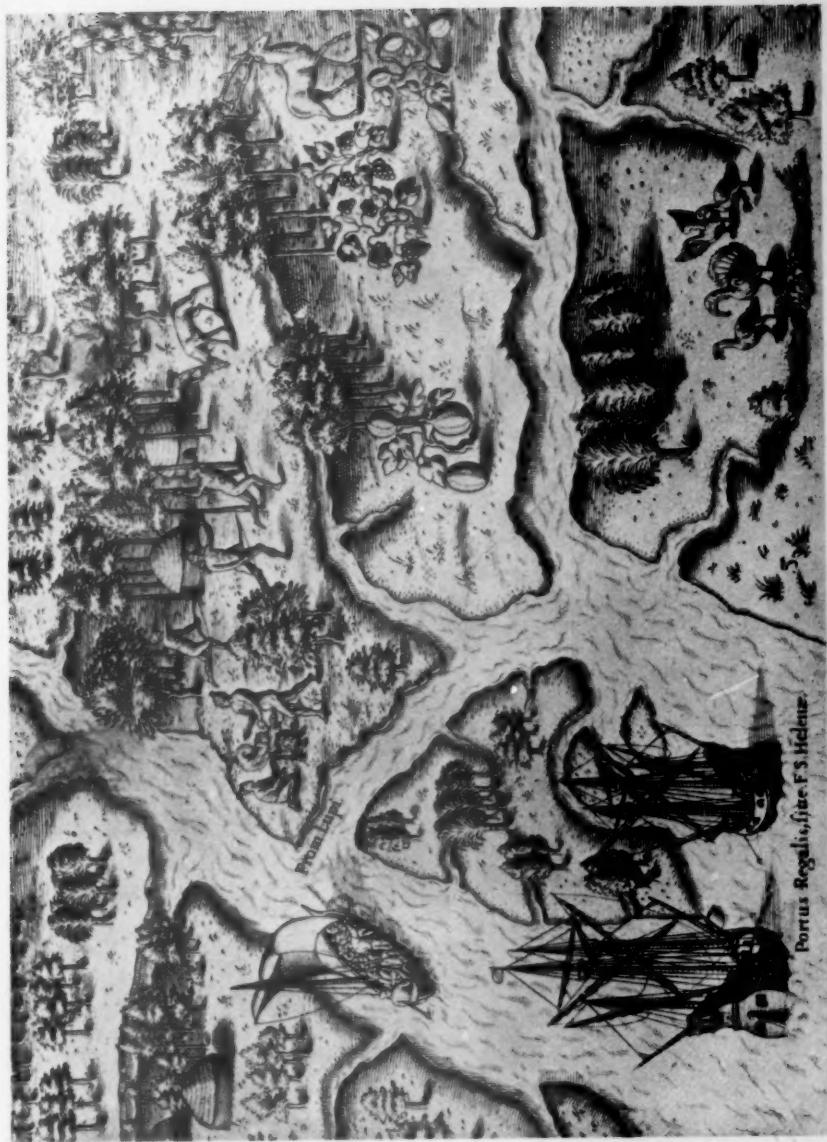
THE contribution of French travellers to American ornithology is well substantiated in our early annals. From Jacques Cartier to Charles Lucien Bonaparte many names come quickly to mind, among them the Récollect missionary Sagard-Théodat, the haughty French officer Baron La Hontan, and the dynamic man of action Samuel de Champlain. These, and many others, are familiar figures closely identified with the early history of our science. There is, however, a place unfilled in our records, a place which should bear the name of a talented French artist who studied American birds even before that ill-fated Roanoke Colony had its inception in 1585. The work of the English artist John White of the Roanoke Colony was the subject of a previous paper,¹ and it seems fitting that some account of this Jacques Le Moyne, who antedated White, should be brought to the attention of American ornithologists.

Many of the French writers, and those of other nationalities as well, have left journals of their experience in America from which can be garnered interesting, though incomplete descriptions of American birds. But the pre-colonial traveller who, in addition to the usual journalistic account, attempted to make some pictorial record of our bird life was rare indeed and should be treated in some detail. It is unfortunate that this is not more fully possible (since most of the ornithological material appears to be lost), but the artist gathers great importance, nevertheless, from the fact of his priority in America as a painter and sketcher of birds, and also from the fact of his contribution of a very early account² of America, including the first map of our southeastern coast. Effort has been made, therefore, to assemble from several obscure sources what has been recorded on Jacques le Moyne, or James De Morgues, as he was also called, the earliest pioneer in zoological art in America.

Some twenty years before Sir Walter Raleigh's better-known attempt to found a colony at Roanoke, the French, having failed in their effort to colonize in Brazil, began to consider a colony in North America which should serve as a haven for the persecuted Huguenots or Protestants of France. Admiral Coligny, who was himself a convert to Protestantism, was in charge of the enterprise, and he named Captain Jean Ribault as the

¹ Allen, Elsa G. 'Some sixteenth century paintings of American birds.' *The Auk*, vol. 53, January 1936.

² 'Brevis Narratorio,' Part II, De Bry Voyages, Frankfurt a. Main, 1591.



LIFE AT FORT CAROLINE AS SEEN BY THE FRENCH ARTIST JACQUES LE MOYNE IN 1564

commanding officer of the first of three expeditions by the French to the east coast of Florida, Georgia, and South Carolina. This was in 1562, and although the purpose of the expedition was primarily to reconnoiter, with future colonization in mind, Ribault nevertheless found the country so alluring that he could not forego establishing a small colony of thirty men on the Port Royal River near what is now Beaufort, South Carolina. Of his impression of the fine country to which he had come, he says: "And the sight of the faire meadows is a pleasure not able to be expressed with tongue, full of Hernes, Curlues, Bitters, Mallards, Egrepths, Woodcocks, and all other kinds of small birds."

Having left this group of thirty men he found he was short of help and supplies, and had to return to France without continuing up the coast, as had his predecessor Verrazanno, whom he had planned to follow. One of Ribault's officers, René Laudonnière, accordingly was put in charge of the second expedition in 1564, and it is of special interest to modern naturalists that one of his officers was Jaques Le Moyne, called a "special painter and mathematician," who was chosen by Coligny, as the latter said, "to make an accurate description and map of the country and drawings of all curious objects." So far as is known this was the first time that an artist had been commissioned to study and delineate the objects of our natural history. It is disappointing that so little of an ornithological nature appears to have been done, but it is exceedingly interesting that nearly 400 years ago and over 150 years before Mark Catesby set foot on American soil, a French artist lived for nearly a year in the wilderness of South Carolina, devoting his time to drawing and observation.

Le Moyne is known also to have written an account of his stay in America. This narrative, 'Brevis Narratorio,' forms the second part of Theodore De Bry's collection of 'Great Voyages' and was published in 1591. It is illustrated by drawings done by Le Moyne, most of which represent the Indians, their customs and ceremonies, and many depict the barbarous treatment of the Huguenots by the neighboring Catholic settlers of New Spain or Florida. But it is of particular interest to us that one of the large illustrations of the 'Brevis Narratorio' includes several figures of Wild Turkeys (Plate 6), one of which is represented in full display with spread tail, dropped wings and drooping wattle. Alligators, manatees, stags and shells also are pictured in the same scene, as well as the natives' method of stalking wild animals by disguising themselves under deer hides.

According to the noted antiquarian, Henry Stevens of Vermont, to whom I am indebted for my introduction to the early artists, John White and Jaques Le Moyne, the Sloane Manuscript No. 5270, now housed in the Department of Prints and Drawings of the British Museum, contains a mixture of originals by these artists but we do not know precisely which ones are by Le Moyne.

Although Le Moyne's name has been omitted from the usual dictionaries of painting and biography, he does appear very briefly in the German publication 'Thieme-Becker Kunster Lexicon,' vol. 23, and from this I learned of the whereabouts of the water colors hereinafter described. We know from Johann G. Kohl writing in the 'Documentary History of the State of Maine,' 1869, and from Henry Stevens's work on 'Hariot and his Associates,' 1900, that Le Moyne was a prominent man, well known as an artist; that he spent a year (1564-65) in and around Fort Caroline, and was one of the few who with René Laudonnière and Nicolas Le Challeaux, a carpenter, escaped the Spanish massacre under Menendez. We gather also that he accompanied Laudonnière on his exploring trips up the river from Fort Caroline which must have given him impressions of bird and animal life which he committed to paper. That he was able to save any of his drawings done at Fort Caroline is questioned by the American historian, Jared Sparks, for Le Moyne but narrowly escaped the massacre and wandered for several days in the swamps and wilderness before being picked up by the French ship 'La Perle' on her way to France. Sparks asserts that such drawings as Le Moyne did must have been done from memory after his return, aided by the accounts written by Laudonnière and the aforementioned carpenter of the expedition, Nicolas Le Challeaux. On the other hand, Henry Stevens, one of the greatest authorities on early American history, maintains that Le Moyne not only wrote an account of his experience in America but also brought drawings back to England in November, 1565. It appears that the 'Perle' was driven to Wales by storms and Le Moyne with others bound for France disembarked at Swansea in Wales, where they remained for some time until their strength was restored, and then crossed over to Rochelle. This was during the height of religious wars in France, and Le Moyne, being a Protestant, probably spent more or less time in London. He is said to have gathered up his drawings and art materials during the massacre of St. Bartholomew in 1572 and to have fled to London. No report of his return to France has been found.

It should be mentioned that another member of the Huguenot group who escaped from the Spaniards at Fort Caroline was a young man named De Bry who is thought to have been a kinsman of the De Bry family of engravers of Frankfort-am-Main. It was through him that Laudonnière's account of the Florida experience edited by Bassanier became known to Theodore De Bry and Richard Hakluyt. These two enterprising minds were evidently in accord and when Hakluyt heard through Bassanier that Le Moyne had some paintings and drawings of Florida life and conditions, he persuaded De Bry to approach Le Moyne on the subject of providing illustrations for Laudonnière's Journal. Accordingly De Bry went to

London in 1587 to see Le Moyne and found him living in Blackfriars (one of the old historic sections of London) as Stevens says, "in the service of Raleigh acting as painter, engraver on wood, a teacher, art publisher and book seller." De Bry hoped to secure all of Le Moyne's drawings for a publication on Florida but Le Moyne was unwilling to part with the entire lot, probably because he had a plan of his own for their publication, but being in the service of Raleigh who at this time had a patent for colonization in America, he did not feel free to carry it through.

It is not clear how many of Le Moyne's drawings were secured by De Bry on his first trip to London but he evidently kept the scheme in mind, for the following year, 1588, after Le Moyne's death, De Bry opened negotiations with the widow for more, but apparently not all, of her husband's drawings together with his journal on Florida. De Bry thus came into possession of materials for the second part of his 'Perigrinations' or 'Great Voyages' and was already planning to use John White's account and his drawings as the first part.

Le Moyne by these circumstances had become very closely associated with Sir Richard Hakluyt, Sir Walter Raleigh, Captain John White, Sir Thomas Hariot, and De Bry, and is seen as a key figure in the English enterprise of western planting. By a series of several incidents which turned his findings to the uses of Raleigh, Le Moyne, the French artist and portrayer of the aboriginal American scene, became the one who was responsible more than any other man for the rise of English influence and the wane of French on our Atlantic seaboard during the infancy of our history.

Although so little by Le Moyne relating to birds can be definitely identified, it is interesting to know that other samples of his art as a painter of natural-history subjects have recently come to light. These are a series of fifty-nine water-color drawings mostly of flowers and fruits but a few moths and butterflies also appear. This folio album is now housed in the Victoria and Albert Museum in London, where it was exhibited about twelve years ago as a sample of early bookbinding. I was hopeful of finding some of his work on birds when I finally learned the whereabouts of this collection, but unfortunately there is not a single one among them. The drawings are beautifully executed with great detail and give the impression of miniatures; the colors are perfectly preserved and the antiquity of the paintings makes them of great interest to the modern water colorist and also to the modern naturalist.

In the 'Gardener's Chronicle,' an English publication, for January 28, 1922, there is an article by one S. Savage on "The Discovery of some of Jakes Le Moyne's Botanical Drawings." According to this commentator the plants are the common garden varieties of England and France and he

points out also that the paper on which the drawings were done bears a watermark which identifies the paper as having been made at Paris and Arras in 1568. From this Savage deduces that the drawings were done after Le Moyne's return from America, which was in 1565. The drawings are further authenticated by the presence of the name "domorgures" on one of the folios.

While in London, I took opportunity to examine another work by Le Moyne, an exceedingly rare little book of woodcuts of beasts, birds, flowers, and fruits with their names in Latin, French, German and English, known as '*Le Clef des Champs*' ('The Key of the Fields'), printed in Blackfriars in 1586. Here I must confess to being struck with the great discrepancy between the crude artistry of these drawings as compared with the beautiful technique evidenced in those recently discovered and housed in the Victoria and Albert Museum. The little book is an oblong quarto containing twenty-four mammals, twenty-four birds, twenty flowers, and twenty-four fruits. No American species appear in the section on birds except the introduced and now ubiquitous House Sparrow and Starling. The sparrow in particular is rather well drawn but the work, especially in so far as the bird matter is concerned, is clearly only a picture book of but little scientific value or artistic merit and must represent some youthful work by the artist. However, it is interesting as a very early example of a natural-history book and it gathers enhancement by being exceedingly rare (only three copies are known) and by having been done probably by the first artist who worked on American natural-history subjects. Furthermore, the fact that other work by Le Moyne has so recently come to light, leads us to hope that more drawings of birds, which we are assured he did in America, may yet be found.

The dedication of this little book, '*Le Clef des Champs*,' throws some light on the artist's connections in London. Far from being a nonentity, too obscure to merit inclusion in dictionaries of art and biography, he appears to have been well known, if not indeed important, and so closely in touch with leading figures of the romantic years of Elizabeth's reign, that he naturally became acquainted with some of the most prominent and royally favored in London. As testimony of this, '*Le Clef des Champs*' bears the dedication "À ma dame Madame de Sidney," signed "votre très affectionné Jaques Le Moine dit de morques peintre." On the reverse of the second leaf there is a sonnet 'à Elle même' with the initials J. L. M. The lady was none other than Mary Sidney, Countess of Pembroke, the beautiful and talented sister of Sir Philip Sidney, and collaborator with him in writing poetry as well as a poet and writer in her own name. This links Le Moyne with one of England's most aristocratic and gifted families. It has been suggested that he may have been in the Sidney home in a

tutorial capacity, but be this as it may, the quest for biographical notes on this very early pioneer in zoological art should furnish a task of unusual zest to the ornithologist with an interest in the history of his science.

A few fragmentary notes may be added. Le Moyne was a native of Dieppe, a shipping town on the north coast of France, as were also Jean Ribault, Laudonnière, and many others of the French Huguenot expeditions. He was born probably about 1530 and was therefore about thirty-five years of age when he visited America. He died in London in 1588, and a search of the registers of the Huguenot Society of London reveals the fact that he was listed in the 'Return of Aliens' living in the Blackfriars district of London in 1582. The entry is as follows: "James Le Moyne, alias Morgen, paynter, borne under the obedience of the French Kinge, and his wife came for religion and are of the Frenche Church. He hath one child borne in England" (Huguenot Society of London Publications, vol. 10, pt. 2, p. 354).

Laboratory of Ornithology

Cornell University

Ithaca, New York

A NEW RACE OF WILD TURKEY

BY ROBERT T. MOORE

FOR many years it has been known that Wild Turkeys inhabit the western slopes of the Sierra Madre of northwestern Mexico, but, so far as a fairly exhaustive search of records indicates, no actual specimens had been taken by a zoologist until our 1933 expedition to southeastern Sonora. In May of that year an adult male was observed by the author near Mirasol, Sonora, and on the 19th two females were secured near Barromicon, one on the Sonora side of the Sonora-Chihuahua boundary line and one on the Chihuahua side. On the next year's expedition a female was collected by the author at Guayachi, Chihuahua, on the western slope of the Sierra. These birds prove to be different from *Meleagris gallopavo merriami* of Arizona and also from the birds of eastern Durango and the eastern slopes of the Sierra Madre in Chihuahua, and are herewith described.

*Meleagris gallopavo onusta*¹ subsp. nov.

Type.—Female adult, No. 9043, collection of Robert T. Moore; two miles south-east of Guayachi, Chihuahua, twenty miles northeast of junction of Rios Chinipas and Fuerte, western slope of the Sierra Madre (altitude about 6400 feet), May 12, 1934; collected by Robert T. Moore.

Subspecific characters.—Male: nearest to *Meleagris gallopavo merriami* Nelson, but tips of upper tail coverts and rectrices white, instead of light buff; subterminal narrow cinnamon bar of *merriami* absent; black bar immediately anterior to it usually or always absent; inner and outer margins of secondaries and primaries less cinnamon, more dull brown and white; iridescence both above and below darker, less brilliantly green and copper. Female: differs in all respects as the male, but the barring of the rectrices characteristic of the males of both races, is less distinct. *M. g. onusta* differs from *M. g. mexicana*, if this form must be recognized as covering birds from Jalisco to southern Chihuahua east of the Sierras, in having the median² rectrices barred, instead of mottled or vermiculated, the same distinction generally applying to the other rectrices; and less amount of cinnamon anterior to the white tips on tail and tail coverts. It differs from typical *M. g. gallopavo* ranging from Vera Cruz to Michoacan, in barring of its rectrices; rump pure black without green iridescence; size larger.

Range.—Breeding range probably confined to the Transition and Lower Canadian Zone of western slope of the Sierra Madre of northwestern Mexico at an altitude of approximately 8500 feet to 4000 feet, descending still lower in the autumn, as it is known to feed on the cornfields of the Indians as low as about 2500 feet.

The boundary of its northern extension along the western slopes of the Sierra in Sonora is not determined, although turkeys are known to occupy the slopes of the mountains of east-central and northeastern Sonora. The southern limit of its

¹Latin *onustus* = burdened, referring to the heavy body this very large turkey carries.

²Due to loss or individual variation, the rectrices vary from 16 to 20. The male of *onusta* has 18, the median pair being present. It is easily distinguishable.

range is also in doubt, but it certainly reaches southeastern Sinaloa, since the author was told of its presence by the Indians of Rancho Batel.

Specimens examined.—*M. g. onusta*: SONORA, 1 ♀ near Barromicon; CHIHUAHUA, 1 ♀, Chihuahua side of Chihuahua-Sonora State Line near Barromicon; 1 ♀, Guayachi (type); 1 ♀, San José; DURANGO, 1 ♂, Muertocito. *M. g. merriami*: ARIZONA, 7 ♂ (including type), 3 ♀, Winslow; 2 ♀, White Mts.; 1 ♂, Sacramento Mts.; 1 ♂, La Jara; NEW MEXICO, 2 ♂, Cloudcroft; 1 ♀, Pecos Baldy; 1 ♂, 2 ♀, Manzano Mts.; 2 ♂, San Mateo Mts.; CHIHUAHUA, 1 ♂, west side San Luis Mts. *M. g. intermedia*: TEXAS, 6 ♀, Corpus Christi; 1 ♂, near Newton; NUEVO LEON, MEXICO, 1 ♂, 3 ♀, Montemorelos; 1 ♂, Cerra de Silla; TAMAULIPAS, 1 ♂, Soto de Marmia; 1 ♀, Forlon. *M. g. silvestris*: VIRGINIA, 1 ♂, Leesburg; SOUTH CAROLINA, 1 ♀, Jamestown; 1 ♀, Santee Club; NORTH CAROLINA, 1 ♀, Mt. Mitchell State Game Refuge; 1 ♀, Pisgah Forest; ARKANSAS, 1 ♀, Lake Wapanoca; OKLAHOMA, 1 ♂, Wichita National Forest. *M. g. osceola*: FLORIDA, 1 ♂, New River; 1 ♂, 1 ♀, Aucilla River; 1 ♂, Illahaw. *M. gallopavo gallopavo*: VERA CRUZ, 1 ♀, Mirador; 1 ♂, Zacuapam; MICHOACAN, 4 ♂, 7 ♀, La Salada. Intergrades between *merriami* and *M. g. gallopavo*: DURANGO, 1 ♂, 1 ♀, El Salto; CHIHUAHUA, 3 ♂, 2 ♀, 2 im. ♂, Colonia Garcia; 1 ♂, Pacheco River; 1 ♂, Bonita Creek.

Remarks.—In Peters's 'Birds of the World' (vol. 2, p. 140, footnote) an excusable error occurs, due to the apparent absence of a formal recording of a specimen, taken by Major Goldman at Mirador, Vera Cruz, namely, that "the occurrence of this form on the eastern slopes of the cordillera in Vera Cruz has never been proved." Major Goldman secured his specimen in November 1903, and another specimen, now in the U. S. Biological Survey collection, Washington, was obtained by Sartorius at Zacuapam. Major Goldman tells me that at the time of his visit turkeys were known in Vera Cruz, but had already become rather scarce. These records probably indicate that a Wild Turkey was at one time much more common in the mountains of Vera Cruz, for in the first place it is now universally agreed that the turkey, which the Spanish explorers conveyed to Spain, originated either from wild turkeys or turkeys already domesticated, in eastern Mexico; and in the second place, if turkeys can exist in a wild state in the mountains of Vera Cruz today, it is logical to infer that a wider distribution occurred three centuries ago and undoubtedly included these mountains. It is also generally accepted that the Wild Turkey of southern Mexico should receive Linnaeus's name of *gallopavo*. Therefore, in view of these additional records it seems logical to go one step farther: I herewith suggest that the type locality of *Meleagris gallopavo gallopavo* Linnaeus be restricted to Mirador, Vera Cruz, where it could have occurred in the wild. I have compared these two specimens with a good series from Michoacan, with which they are identical. The range of *M. g. gallopavo* therefore extends from Vera Cruz to Michoacan. In making the above suggestion I am not overlooking the possibility that the present wild bird of Mexico has some admixture of domesticated blood, but I think this can be properly disregarded, for the

following reasons: (1) all of the races of *M. gallopavo* in the wild state in the United States also show this same admixture; (2) the presence of domestic blood has not modified the characters of any of the wild races today, so that they cannot be readily distinguished from one another and this admixture is so weak a factor, that it appears only in a few individuals and can be easily separated; (3) the birds of Vera Cruz and Michoacan (true *gallopavo*), taken in the wild state, are more clearly differentiated from all the other races than these latter races are from one another. All these specimens have pure-white tips to the rectrices and upper tail coverts, markedly distinguishing them from the birds of the United States, even from *merriami*, in which this area is buffy.

The above designation of the type locality of *M. g. gallopavo* makes it necessary to consider the possibility of resurrecting Gould's name, *mexicana*, based on a bird probably taken by Floresi at Bolaños, Jalisco. As Nelson (Auk, vol. 17, p. 122, 1900) has pointed out, it is possible that the two specimens from El Salto, Durango, represent *mexicana*; nevertheless, I feel that these individuals and others from the east slope of the Sierra of Chihuahua are nothing but intergrades between true *gallopavo* and *merriami* and I deem it wiser to leave *mexicana* buried as a synonym of *gallopavo*, at least until a series can be taken from Bolaños.

Following the present distribution of the turkeys of North America from the northeast to the southwest, we find a distinctly 'reddish' bird in north-eastern United States with tail and upper tail coverts largely chocolate red. As we proceed toward the southwest, we discover the chocolate turning to cinnamon, and becoming less prominent. *M. g. onusta* is the extreme dark form of the species.

KEY TO RACES OF *Meleagris gallopavo*

(Based chiefly on males)

- A. Upper tail coverts and rectrices (to a less extent) largely Chocolate¹ or Cinnamon, the tips Chocolate.
- B. Tips of upper tail coverts Chocolate.
 - C. White bars on outer primaries and outer secondaries broad and conspicuous; inner secondaries barred. *M. g. silvestris*—eastern United States,—central Pennsylvania to Oklahoma, eastern Texas and northern Florida.
 - CC. White bars much restricted and often broken; inner secondaries without bars, dirty grayish brown. *M. g. osceola*—central and southern Florida.
 - BB. Tips of upper tail coverts dirty brown. *M. g. intermedia*—middle northern Texas, south to Tamaulipas.
- AA. Cinnamon on upper tail coverts much reduced, the tips white or light buff.
 - B'. Rectrices barred with cinnamon and black; rump black with faint or no green iridescence; size larger.

¹Capitalized names of colors in this paper taken from Ridgway, 'Color Standards and Color Nomenclature,' 1912.

- C'. A subterminal cinnamon bar next to tip of rectrices, including median pair, and generally a wide black bar anterior to it; tips of upper tail coverts light buff; margins of secondaries and primaries more cinnamon. *M. g. merriami*—southern Colorado, Arizona, New Mexico, western Texas and northern Chihuahua east of Sierra Madre.
- CC'. No cinnamon subterminal bar on rectrices and black bar generally absent on median pair; tips of upper tail coverts and rectrices pure white; margins of secondaries and primaries less cinnamon and duller brown. *M. g. onusta*—western slopes of Sierra Madre in southeastern Sonora and Sinaloa.
- BB'. Rectrices vermiculated or mottled, not barred; rump distinctly marked or barred by green iridescence; size smaller. *M. g. gallopavo*—Vera Cruz to Michoacan and in intergrading form to Durango and southern Chihuahua east of Sierra Madre.

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TWO NEW RACES OF NORTH AMERICAN BIRDS

BY W. E. CLYDE TODD

FOR a number of years I have been aware that the Black-capped Chickadee of the 'North Country' is not the same as the bird with which I am familiar in western Pennsylvania. The impression gained in the field has been confirmed by study of the specimens collected—thirty skins in all. The differences, although slight, are obvious and constant, but whether they deserve nomenclatural recognition is another question. In reaching an affirmative decision I have admittedly been influenced by the opinions of certain other ornithologists who have inspected our series of specimens. At the risk, therefore, of being accused of proposing another 'millimeter race,' I call it

Penthestes atricapillus anamesus subsp. nov.

Type.—No. 100,002, Collection Carnegie Museum, adult male; Mattice, northern Ontario, May 21, 1926; W. E. Clyde Todd.

Subspecific characters.—Similar to *Penthestes atricapillus atricapillus* (Linnaeus) in size, but lighter colored, the sides and flanks with less buffy wash, and the gray of the back paler. Similar also to *Penthestes atricapillus septentrionalis* (Harris), but smaller, and with the white wing- and tail-edgings averaging narrower.

Range.—From the Gulf of St. Lawrence (north coast) west to James Bay (and Manitoba ?), south probably to the limit of the spruce and fir forest.

Remarks.—Ten males in fresh autumn plumage average: wing, 66.5 mm.; tail, 63—agreeing substantially with the measurements of true *atricapillus*. In color characters, however, they conform much better to *septentrionalis*, and could be referred thereto were it not for their smaller size and less 'hoary' wings and tail. Thus these northern birds constitute a slightly differentiated race, intermediate between *atricapillus* and *septentrionalis*. The exact limits of its range to the westward remain to be worked out.

In this connection I propose to fix the type locality of *Parus atricapillus* Linnaeus ex Brisson, described from "Canada," as the City of Quebec, on the same general grounds as in analogous cases. Through the courtesy of Dr. G. A. Langelier I have been able to examine a series of specimens from this locality. They prove to be precisely the same as our birds from northern and western Pennsylvania.

Three races of the Sharp-tailed Sparrow, *Ammospiza caudacuta* (Gmelin), are currently recognized and find a place in the latest edition of the A. O. U.

'Check-list.' These are: (1) typical *caudacuta*, breeding along the Atlantic coast from New England to Virginia; (2) *subvirgata*, in the Maritime Provinces of Canada; and (3) *nelsoni*, in the upper Mississippi Valley and thence north to Great Slave Lake (the validity of a supposed fourth race, *diversa*, described from the coast of North Carolina, need not concern us here). All three forms mingle during the winter in Florida. The characters of these several races have been so well and ably discussed by Dwight (Auk, 13: 271-278, 1896) and by Ridgway (Bull. U. S. Nat. Mus., no. 50, 1: 220-224, 1901) that it is unnecessary to reiterate them at length. Both authors call attention to the existence of specimens that suggest intergradation between *nelsoni* and *subvirgata*, although their respective breeding ranges are more than a thousand miles apart.

During my first visit to Moose Factory, northern Ontario, in June, 1908, I heard repeatedly the song of a bird which I suspected was a Nelson's Sparrow—a surmise that was eventually proved to be correct by the capture of the individual in question. Later expeditions have increased the series from James Bay to twenty-four specimens, three of which are breeding birds. Compared with a series of twenty-two breeding birds from Saskatchewan, these three specimens obviously represent a different race, intermediate in its general characters between *nelsoni* (as represented by the Saskatchewan series) and *subvirgata*. It may be called

***Ammospiza caudacuta altera* subsp. nov.**

Type.—No. 100,232, Collection Carnegie Museum, adult male; East Main, James Bay, Quebec, June 29, 1926; George M. Sutton.

Subspecific characters.—Similar to *Ammospiza caudacuta nelsoni* (Allen), but general coloration lighter. The blackish-brown lateral stripes on the pileum are narrower and the grayish median stripe is correspondingly wider; the superciliaries are paler buff, and the auriculars more grayish and more strongly contrasted with the surrounding parts; the wing coverts and secondaries have paler rusty buff edgings; there is less brownish shading on the back, and the white streaks are less prominent.

Range.—Breeds in the marshes of southern James Bay, migrating to the Atlantic coast and wintering southward to Florida (at least occasionally).

Remarks.—Autumn specimens of the new race differ from a series in comparable plumage from Presque Isle, Erie County, Pennsylvania, precisely as do breeding birds. The pertinence of the name *nelsoni*, which was based on autumn specimens from the Calumet Marshes, northern Illinois, was settled by direct comparison with specimens from the type locality, courteously placed at my disposal by the U. S. National Museum. These agree precisely with the brownish-backed, deeply colored form which breeds in North Dakota and the Canadian Provinces to the northward, and winters in Florida. The new race evidently moves eastward to the Atlantic coast

in beginning its southward migration, instead of southward to the Great Lakes; this accounts for the number of presumed intergrades between *nelsoni* and *subvirgata* recorded from the former region. We have two specimens from the coast (Amelia Island, Florida, and St. Helena Island, South Carolina) which I refer to this form (the latter with a query).

I am greatly indebted to the authorities of the U. S. National Museum and the Biological Survey for the loan of specimens for the present study.

Carnegie Museum
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GENERAL NOTES

Western Grebe in Colorado.—The Western Grebe (*Aechmophorus occidentalis*) has been considered a rare bird in Colorado and there are comparatively few specimens in State collections. The many irrigation reservoirs are unfavorable for nesting sites because of the great fluctuation in water levels, and as there are not many natural lakes suitable for breeding areas, this bird has not been found nesting. During the past season two grebes were observed on Barr Lake, Adams County, on May 24, and on May 31, several were seen by R. J. Niedrach and H. G. Smith.

An amazing concentration of Western Grebes was observed by the undersigned on Barr Lake on June 17 on a sheltered inlet along the southern shore. There was a slick calm without a breath of air to stir the surface of the cove, and mirrored here and there over the surface were pairs of birds, often in groups of half a dozen. Many were going through their characteristic courtship glides, and others seemed to be showing interest in stands of vegetation appropriate for nesting sites. With one sweep of the glass, we counted fifty-two birds, and some, no doubt, were below the surface of the water. We returned a few days later and found that water had been withdrawn from the lake for irrigation purposes and that no vegetation suitable for concealing nests remained in the water. Only a half dozen birds were seen, and although they remained on the lake for the next few weeks, at least, no evidence of their nesting was obtained.—ALFRED M. BAILEY AND ROBERT J. NIEDRACH, *Colorado Museum of Natural History, Denver, Colorado.*

Audubon's Shearwater in Massachusetts.—An Audubon's Shearwater (*Puffinus lherminieri lherminieri*) was found dead on the beach at Chilmark, Martha's Vineyard, August 13, 1937, by Francis Minot and Wilson Olney. Suspecting, because of its small size, that the bird might prove to be this species, Mr. Minot brought it to the New England Museum of Natural History in Boston. Messrs. James Lee Peters and Ludlow Griscom at the Museum of Comparative Zoology, Harvard, made the identification. The measurements were as follows: wings, 184 mm., 187 mm.; exposed culmen, 31; depth at base, 9; least depth, 6.8; width at base, 12 plus; tail, 85. The wing is short but all other measurements are clearly typical of *lherminieri*. This constitutes the first record for the species in New England. Unfortunately a gull had started to eat the neck of the specimen, rendering it unfit to mount for exhibition purposes, but it makes a satisfactory skin in the study collection.—JULIET RICHARDSON, *New England Museum of Natural History, Boston, Mass.*

American Egret along the upper Hudson River.—All recent records tend to indicate that the American Egret (*Casmerodius albus egretta*) has become increasingly common in New York State during its post-breeding wanderings. This is particularly true during the present season in the territory along the Hudson River which appears to serve as a more or less well-marked fly-way for the bird. Since this egret recently has been reported to nest in southwestern New Jersey (Stone, W., *Auk*, 51: 368-369, 1934) and other northerly breeding records for it have appeared in the literature not long since, perhaps an increase in its numbers is to be expected in the Albany and contiguous sections of the Hudson River Valley. The following late summer records for 1937 are offered by way of illustrating the bird's status in this territory.

A correspondent, Dr. Samuel J. Pashley, of Hudson Falls, New York, writes me under date of July 23, 1937: "For the last three days five adult egrets have been

feeding along a branch of Big Creek, about one mile west of South Hartford, or nine miles east of Hudson Falls, New York." On August 1, 1937, Mrs. Stoner and I observed a single American Egret at Burden's Pond well within the city limits of southeastern Troy, New York; and on August 6, we saw two others at the Watervliet Reservoir ten miles west of Albany. The comparative fearlessness of all three of these birds was noteworthy.

Since August 8, this egret has become increasingly common in the Albany district but we made no detailed observations or counts until August 15. On this date we motored south along the east bank of the Hudson River—New York State Highway No. 9J—to Stockport station on the New York Central Railroad. We observed no egrets until we had left Schodack Landing twelve miles south of Albany; but between a short distance south of that village and the Stockport station, twelve miles by river, we saw, within the space of one hour six egrets. Five of these were flying north, three in one group; the other was standing in a grassy inlet. The Stockport railroad station is only a few yards from the river and a considerable expanse of low, swampy bank and back waters can be seen from its immediate vicinity. At first we noted but a single egret. About one-fourth of a mile north of the station is a long, narrow marsh grown up mostly in arrow arum (*Peltandra*), pickerel-weed (*Pontederia*), yellow pond-lily (*Nymphaea*) and water rice (*Zizania*). Small areas of open, shallow water occur among the plant growths. This marsh communicates with the river by a slender waterway which flows under the railroad tracks, hence the height of the water in it is influenced by the tide which, at this point, varies from about one and a half to four feet. The tidal movement, in turn, encourages the entrance of various kinds of aquatic life into the marsh thereby rendering it a favorable feeding ground for egrets and other wading birds. This marsh, forty to fifty yards in width, extends in a north-south direction for 1600 feet immediately adjacent to and parallel with the New York Central Railroad tracks and the Hudson River. Its east bank is precipitous and rocky and supports a bordering thicket mostly of oaks and other hardwoods. Its west bank is the cinder roadbed of the railroad. Here, at 1.15 p. m., feeding in the shallow areas among the clumps of aquatic vegetation, were eighteen American Egrets. As I approached, walking along the railroad tracks, the birds took flight, one by one, to a more distant part of the marsh. The noise from a passing high-speed train caused only five of the birds to fly up but they soon dropped into the water again. As I continued toward the farther end of the marsh the assemblage of large white birds congregated there stood out boldly against the green background for a moment, then all eighteen slowly and majestically took flight. Some returned almost immediately to perch and preen in the tall trees bordering the marsh; others made their way to adjoining lowlands; a few of the more venturesome individuals returned to feed before I had left the scene. As a matter of fact the American Egrets were less wary than the lone Great Blue Heron which accompanied them and preceded them in taking wing.

On the afternoon of August 18, we again covered the same territory that we had three days earlier. We observed no egrets until we arrived at Stockport Creek which flows into the Hudson River near the Stockport railroad station. Three egrets were seen here. Two individuals were feeding in the marsh north of the station while three others perched in an oak tree on its bank. So, only five individuals were assembled where we had observed eighteen on August 15. However, in the three and one-half hours which we spent in this vicinity we observed a total of at least fifteen different egrets; thirteen of these were visible at one time on the neighboring marshy expanse of the river.

In an endeavor to ascertain the local status of the American Egret in the adjacent territory to the north, we investigated the banks of the Mohawk River between Niskayuna village and a point three miles east of it on the afternoon of August 20. Here within the space of one hour, 5.30 p. m. to 6.30 p. m., we observed a total of eighteen egrets. All were standing motionless or feeding along the low cat-tail bordered banks and inlets. This section is from four to seven miles west of the junction of the Mohawk and Hudson Rivers at Cohoes about nine miles north of Albany.

Our late-August records for the Albany region may, then, be summed up as follows. In a two-hour period between 11.30 a. m. and 1.30 p. m., on August 15, we observed, flying over the Hudson River and feeding in bordering marshes, a total of twenty-five American Egrets within a distance of twelve miles; eighteen of these were in one small marsh. Three days later, between 3.40 p. m. and 7.10 p. m., we observed, in the same territory, at least fifteen different individuals; possibly some of these were birds seen on August 15. And, between 5.30 p. m. and 6.30 p. m., on August 21, we observed at least eighteen different individuals along a three-mile extent of the Mohawk River some thirty-five miles northwest of the locality of the preceding observations and from four to seven miles west of the Hudson River.

It is altogether likely that other swampy shores and inlets in both the upper Hudson and the lower Mohawk Rivers harbored comparable numbers of American Egrets unseen by us. This probable condition when taken in conjunction with our own actual counts and the observations of others would appear to warrant the conclusion that, seasonally and locally at least, this egret is considerably more common than usual. Perhaps it is not too much to hope that it will increase unmolested and that its breeding range may even be extended into New York State.—DAYTON STONER, *New York State Museum, Albany, New York.*

American Egret in Quebec.—On September 14, 1937, fourteen American Egrets, (*Casmerodius albus egretta*) were observed by the writer, feeding in the marshy upper reaches of the South River (tributary of the Richelieu River), six and a half miles north of the international boundary, in the Province of Quebec, Canada. This flock was kept under constant observation for two and a half hours, and presented a picture which it is not often one's privilege to see in eastern Canada. Unfortunately the duck shooting commenced next day, with the result that the flock was disturbed and thought to have left the district. However, a check-up on their movements revealed that they had split up into twos and threes, and could still be seen at widely separated points.—J. D. CLEGHORN, *McGill University, Montreal, Canada.*

American Egret and Anhinga nesting in Oklahoma.—Until May 11, 1937, it was not known to ornithologists that *Casmerodius albus egretta* and *Anhinga anhinga* bred in the State of Oklahoma. On that date a local guide took my daughter Constance and myself to visit a heronry of "White Cranes" about 7 miles south of Eagletown, McCurtain County, in the southeastern corner of Oklahoma. Here we found several American Egrets and Anhingas on nests, besides many Ward's Herons (*Ardea herodias wardi*) and one pair of Yellow-crowned Night Herons (*Nyctanassa v. violacea*); great numbers of Turkey and Black Vultures (*Cathartes aura septentrionalis*, *Coragyps a. atratus*) were also present. The guide said that "White Cranes" had nested in the region for many years, but that he had not seen an Anhinga before.

The next day he took us to Forked Lake to visit a heronry exclusively of "White Cranes," but not a bird was to be seen, for much of the cypress had been cut the previous summer while the young were in the nests. On learning that the same

thing was to happen to the "Buzzards' Roost Cypress Brake" during the present summer, we got in touch with the Tulsa Audubon Society, with Dr. Paul Sears of the University of Oklahoma, Dr. Charles Gould of the National Park Service and Mr. A. R. Reaves of the State Park Board; through the efforts of these gentlemen, the owner agreed not to cut the cypress this year. Messrs. Hugh Davis and Orrin Letson of Mohawk Park, Tulsa, made several trips to the heronry; by means of 85-foot rope ladders they scaled the cypresses and took splendid pictures of the birds. They calculated the numbers of nesting birds as follows: Anhinga, 10 pairs; American Egrets, 15-20; Ward's Herons, 30-40; Green Herons (*Butorides v. virescens*), 4; Yellow-crowned Night Heron, 1 pair.

We certainly hope that Oklahoma will take steps to preserve the nesting place of these rare birds and also some tracts of the ancient and beautiful cypress which is fast disappearing before the lumberman's ax.—MARGARET M. NICE, 5708 Kenwood Ave., Chicago, Ill.

Snowy Egret in West Virginia.—During the month of September, 1936, a Snowy Egret (*Egretta thula*) spent most of the time at Lake Terra Alta, Preston County, West Virginia, a small artificial body of water, located on top of the Alleghany Plateau, at an elevation of about 2700 feet. Several parties of observers from West Virginia University visited the lake during the month to see this bird, which was, apparently, an adult. The black bill and legs, yellow feet, and entire absence of dark feathers in the wings were checked many times, as the egret had a favorite perching tree, to which it would almost invariably fly when alarmed, allowing a fairly close approach.

There is one previous West Virginia record for this species, a specimen taken by Bibbee along the New River, on the Virginia border. This is the first record for the species from northern West Virginia.—MAURICE BROOKS, *West Virginia University, Morgantown, W. Va.*

Yellow-crowned Night Heron breeding in northern Illinois.—The Yellow-crowned Night Heron (*Nyctanassa violacea violacea*) apparently has not been found nesting in Illinois since the 1870's when it was reported by Robert Ridgway to be nesting near Mt. Carmel (E. W. Nelson, *Bull. Nuttall Ornith. Club*, 1: 43, 1876) and by Otto Widmann opposite St. Louis, Missouri (*Trans. Acad. Sci. St. Louis*, 17: 56, 1907). Thus it was with considerable surprise that on June 4, 1936, at DePue, Bureau County, accompanied by L. G. Brown of Griggsville, Illinois, I located two nests of this species in an Illinois River Great Blue Heron colony of some four hundred nests. At that time both nests contained four eggs, which were being incubated. During the ensuing month I photographed the young and adult birds, obtaining two good photographs of an adult bird at the nest. One fledgling, removed for purposes of study, finally died, and was deposited in the Chicago Academy of Sciences. The remaining seven young birds were banded by Karl E. Bartel of Blue Island, Illinois. C. T. Black, Assistant in Zoology, University of Illinois, aided in collecting the young bird studied.—FRANK C. BELLROSE, *Ottawa, Illinois*.

Scoters on Lake Lynn, West Virginia.—Since West Virginia has no natural lakes and very few extensive artificial bodies of water, the occurrence within the State of any of the more maritime ducks is something of an event. The following notes seem worth recording.

WHITE-WINGED SCOTER, *Melanitta deglandi*.—On the morning of October 24, 1936, northeastern West Virginia and western Maryland had a very heavy flight of wild-

fowl. On Lake Lynn, a sizeable artificial lake in Monongalia County, West Virginia, among other species of ducks and geese were at least fifty White-winged Scoters. Since they were mixed in a raft of some three thousand ducks, it was impossible to make a definite count of the number of individuals of this species. On November 5, 1936, however, in a smaller flock, thirteen males of this species were counted. They were under careful observation for some time, and were raising their wings rather frequently, so that identification was made certain. There are two previous West Virginia records for this species.

SURF SCOTER, *Melanitta perspicillata*.—With the White-winged Scoters noted on November 5, 1936, were nine individuals of this species. They gave the same favorable opportunities for observation as did the last. This constitutes the first West Virginia record for this species, so far as I am aware.

AMERICAN SCOTER, *Oidemia americana*.—Two individuals of this species were noted on Lake Lynn on October 18, 1936, and a pair was carefully identified by Boggs on November 5, 1936. For this species there is one previous West Virginia record.—MAURICE BROOKS AND I. B. BOGGS, *West Virginia University, Morgantown, W. Va.*

Hooded Merganser nesting in Connecticut.—A Hooded Merganser (*Lophodytes cucullatus*) with six well-grown young was observed June 13, 1937, at Farmington, Connecticut. The brood was raised on a pond included in Shade Swamp Sanctuary, a wildlife area maintained by the Connecticut State Board of Fisheries and Game. Apparently the only previously recorded nesting of this duck in Connecticut was a brood observed at Winchester about 1893 by C. H. Williams (Sage and Bishop, 'The Birds of Connecticut', p. 29, 1913, originally recorded by H. K. Job in 'The Sport of Bird Study', p. 290, 1908).—DEAN AMADON, *State Board of Fisheries and Game, Hartford, Connecticut.*

Food and Measurements of Goshawks.—The stomachs of 294 Goshawks (*Astur atricapillus*) I found upon careful examination to contain the following: Ruffed Grouse, 40; Northern Flicker, 2; Eastern Crow, 1; Domestic Fowl, 45; Domestic Pigeon, 1; unidentified birds, 13; total birds, 102. Cottontail rabbit, 23; deer mouse, 1; chipmunk, 1; red squirrel, 4; gray squirrel, 19; shrew, 4; unidentified mammals, 8; total mammals, 60. Contained food, 156; empty, 138.

These hawks, received for bounty by the Pennsylvania State Game Commission, were shot in Pennsylvania between November 1, 1936, and April 1, 1937, the majority in November and December. Little could be learned about the grouse, other than that in the fourteen specimens where their feet were present, four did not have the usual well-worn nails, but exceedingly long ones. As would be expected, the chickens most frequently eaten were those with white plumage; these were: white, twenty-four; Plymouth barred rock, thirteen; and brown or black, eight. Only six stomachs held remains of more than one animal. Nematodes were found in eleven stomachs. Almost all of the hawks were very fat, the females considerably fatter than the males.

Measurements.—The following data were taken on Goshawks from two to nine (average five) days after being shot. These specimens from various parts of Pennsylvania were received for bounty by the Pennsylvania State Game Commission between November 1, 1936, and April 1, 1937.

Weights in grams of Goshawks with stomachs empty or holding less than half a gram of food:—

Age and Sex	Number of specimens	Range in weight	Average weight
First winter			
Males	11	651- 996	830
Females	8	838-1210	1013
Second winter			
Males	6	611- 824	760
Females	12	906-1199	1025
Third winter or older			
Males	46	668-1167	861
Females	80	693-1500	1082

Lengths of Goshawks in millimeters:—

Sex	Number of specimens	Range in length	Average length
Males	110	530- 594	553
Females	177	574- 673	614

Wing spreads of Goshawks in millimeters:—

Sex	Number of specimens	Range in wing spread	Average wing spread
Males	105	1018-1117	1071
Females	181	1099-1216	1168

—MERRILL WOOD, Zoology Dept., State College, Pennsylvania.

Yellow Rail at Lexington, Virginia.—Southern records of the Yellow Rail (*Coturnicops noveboracensis*) are so few that it seems well to put on record two occurrences for the Valley of Virginia. On September 29, 1937, a farmer brought a live bird to me which he had caught while mowing hay along a small stream near Lexington, Virginia. The bird was in dark immature plumage. The farmer said that there were others at the place, probably half a dozen. I kept the bird in a box over the night. Several times it uttered a rolling series of notes, not the *kik-kik-kik*, usually described, but something between a whinny and a chatter, harsh but not sharp. When I released it in the field where it had been caught, it flew a short distance to take cover under the cut hay. I was able to flush it several times, and each time the flight was short. I examined another Yellow Rail in the flesh which had been killed by an automobile near Harrisonburg, Virginia, about October 15, 1936.—J. J. MURRAY, Lexington, Virginia.

Black Rail nesting in New York.—The nest of a Black Rail (*Creciscus jamaicensis stoddardi*) was found at Jones Beach, Long Island, June 20, 1937, the first record for New York State. The young left the nest a few hours after hatching, and tried to use their wings in grasses while climbing. The nest was in fairly short grass with a few scattered rushes, near the edge of a salt marsh, though the nest itself was on the ground where it was dry.—G. CARLETON, R. KRAMER, W. SEDWITZ, O. K. STEPHENSON, 52 West 94th St., New York City.

Key West Quail-dove in Puerto Rico.—The occurrence of the Key West Quail-dove (*Oreopeleia chrysia*) in Puerto Rico has been regarded as doubtful despite various records in the past, due to the fact that no specimens from this island were extant, and due to the possibility of confusion with *O. m. mystacea*. It therefore

gives me pleasure to record that on August 20, 1937, a male *O. chrysia* was brought to me by parties who had just killed it with a car on a mountain road in the district of Afiasco; it is now number 2884 in my collection. It weighed 161.35 grams in the flesh.—STUART T. DANFORTH, *University of Puerto Rico, Mayagüez, Puerto Rico.*

Arkansas Kingbird in Adams County, Illinois.—On August 26, 1937, while driving north of Quincy, Illinois, on Illinois State Highway no. 24, I saw a fine specimen of the Arkansas Kingbird (*Tyrannus verticalis*) sitting on a telephone wire. I stopped my car within twenty feet of the bird, which sat on the wire watching for insects. I have known the species for years in its native habitat in the Southwest. I believe this is the first time it has been reported from western Illinois.—T. E. MUSSELMAN, *Quincy, Illinois.*

Arkansas Kingbird nesting in Michigan.—I wish to report the nesting of an Arkansas Kingbird (*Tyrannus verticalis*) on lot 34, Prairieville, township of Prairieville, Barry County, Michigan. The nest was found on June 30, 1937, in a white oak (*Quercus alba*) from fifteen to twenty feet up and in a crotch some ten feet from the main trunk. The discovery was verified by a party from the Michigan State Summer Session including Professor J. W. Stack and Dr. Miles D. Pirnie of the Kellogg Sanctuary. On July 9, 1937, Professor J. W. Stack made a trip with the intention of banding the young but they had already left the nest and were observed on the branches of the oak in which the nest was found. There were three young.—C. W. BAZUIN, *Grand Rapids, Michigan.*

Virginia's Warbler in Idaho.—On August 24, 1934, I collected two adult male specimens of *Vermivora virginiae* in Joe's Gap, about six miles northeast of Montpelier, Bear Lake County, Idaho. They weighed, respectively, 8.6 and 9.2 grams. This species is unrecorded from Idaho.—PIERCE BRODKORB, *University of Michigan Museum of Zoology, Ann Arbor, Michigan.*

Red-wings feeding on the larch saw-fly.—In the Black Rock Forest, of which I am Director, at Cornwall-on-Hudson, New York, are several ponds one of which, Spruce Pond, contains a small island of perhaps half an acre in extent, and some two hundred yards from the eastern shore. This island is a definite muskeg, with much cat-tail, black spruce, poison sumach, Diervilla, Chamedaphne, sundews and the like, and is a favorite haunt for Red-winged Blackbirds (*Agelaius phoeniceus*). At about two hundred yards from the mainland shore, we have a small plantation of European larch set out in 1928 and now averaging about twelve to fifteen feet tall. The spring of 1936 brought our first infestation of the larch saw-fly (*Nematus ericsonii*). This spring (1937) when the larvae were plentiful in late May or early June, we noticed the Red-wings making regular trips between their nests on the island and the plantation, returning with their beaks full of the wriggling larvae.—HENRY H. TRYON, *Cornwall-on-Hudson, New York.*

Song of the Chipping Sparrow.—In 'A Guide to Bird Song' (pp. 263-264, 1929), A. A. Saunders says of the song of the Chipping Sparrow (*Spizella passerina*): "When the notes of the song are not run together in a trill but can be counted, the number of notes is likely to be sixteen, twenty-four or thirty-two; that is, the bird sings in multiples of eight. But this rule is not invariable, and occasionally songs may contain seventeen or eighteen or twenty-five notes." By studying the film of recordings of Chipping Sparrow songs we should be able to confirm or deny this statement. The number of songs recorded with the sound-recording apparatus at

the Cornell University Laboratory of Ornithology is as yet too meager to afford positive conclusions; but of thirteen songs studied, taken at six different times and from six different birds, but one contained eight notes. The number of notes in thirteen songs was as follows: 35, 52, 20, 35, 44, 22, 19, 20, 16, 15, 12, 19, 11. The result is less than the one-in-eight average which would be expected if the song were given at haphazard.

The senior writer finds himself unable to count accurately the notes of most Chipping Sparrow songs even if they are given rather slowly. Occasionally, if the song is delivered with exceptional slowness, he can count them; but on these rare occasions he has not found anything to suggest that the song is delivered in multiples of eight notes. However, in counting notes in the field, errors seem to be extremely easy to make. A series of laboratory tests was made with the film by playing some of the less rapidly delivered songs, and asking listeners to count the number of notes. Most of the subjects were unable to do so, and rarely counted the number correctly the first time. One member of the staff of the Engineering School, who is an accomplished musician, made the following guesses on a normal song containing twenty notes. He guessed eighteen on the first playing; eighteen or nineteen on the second; he could not estimate the third; and estimated correctly only on the fourth playing. This is offered to show how liable to inaccuracies counting by ear can be. The junior writer, a professional musician, has trained his ear so that he believes he is able to count many Chipping Sparrow songs accurately. Of one hundred and sixty-five songs from six different birds heard in New York, Vermont and New Hampshire, there were but nineteen where the notes were in multiples of eight. On the theory of probabilities there should have been twenty plus.

Taking both pieces of evidence together,—the comparatively few film recordings studied under the microscope, and the more numerous songs counted by the admittedly less-accurate field method,—it does not seem that the Chipping Sparrow's song is delivered in series of eights; or as far as can be gathered, that the song is mathematical or orderly. It would appear to be delivered more or less at haphazard, stopping on any note without particular relation to number. It is not impossible, however, that in the section of Connecticut where Mr. Saunders does much of his field work, the Chipping Sparrow may sing its notes in multiples of eight. There is little doubt that types of singing within a species are often restricted to certain localities, and that these localities can be of very limited area; but these observations indicate that the Chipping Sparrow's song, in most localities, is not usually made up of notes in multiples of eight.—ALBERT R. BRAND AND HAROLD AXTELL, *Laboratory of Ornithology, Cornell University, Ithaca, New York.*

Shorebirds at a Western Maryland Lake.—In Garrett County, the most mountainous and most western of Maryland's counties, is located a large reservoir created for power purposes, Deep Creek Lake. During the very dry summer of 1936, large quantities of water were diverted from this lake, leaving extensive mud flats that were very attractive to shorebirds. Since the lake is located on top of the Alleghany Plateau, it was a matter of unusual interest to see so many species and individuals in a mountain setting. Following are the species noted:

SEMIPALMATED PLOVER, *Charadrius semipalmatus*.—Very common on September 20, and for several days following; last noted on October 24.

KILLDEER, *Oxyechus vociferus vociferus*.—As might be expected, these birds were present in great numbers, both during the breeding season and during migration. They were still present in good numbers on November 25, although parts of the lake were then covered with ice.

WILSON'S SNIBE, *Capella delicata*.—Common throughout the fall around the arms of the lake, where they may possibly breed sparingly; still present on November 25.

SPOTTED SANDPIPER, *Actitis macularia*.—Abundant breeding species; still common in October. Last noted on October 24.

SOLITARY SANDPIPER, *Tringa solitaria*.—Very common throughout the fall until late in October. For a discussion of this as a possible breeding species at Deep Creek Lake, see 'The Auk', vol. 53, p. 444, Oct. 1936.

GREATER YELLOW-LEGS, *Totanus melanoleucus*.—Common during September and early October; last noted on October 25.

LESSER YELLOW-LEGS, *Totanus flavipes*.—For some reason not so common as the last during the time of our observations. A few were seen in September and October.

PECTORAL SANDPIPER, *Pisobia melanotos*.—Common during September and October; last noted on November 5.

WHITE-RUMPED SANDPIPER, *Pisobia fuscicollis*.—A few individuals were seen on several dates in October.

BAIRD'S SANDPIPER, *Pisobia bairdi*.—One individual noted and carefully observed by John Handlan, Lloyd Poland, the writer, and others on October 18; and another seen by A. S. Margolin, Poland, and the writer on October 24.

LEAST SANDPIPER, *Pisobia minutilla*.—Seen on September 20, and on a few dates thereafter until October 18.

RED-BACKED SANDPIPER, *Pelidna alpina sakhalina*.—Two individuals were seen by Handlan, Margolin, Poland, the writer, and others on October 18.

STILT SANDPIPER, *Micropalama himantopus*.—Just previous to September 20, a severe storm swept up the Atlantic Coast; its effects were felt far inland. With an unusually large flock of shorebirds at Deep Creek Lake on the above date was a single individual of this species. It was carefully identified with good glasses at short range.

SEMI-PALMATED SANDPIPER, *Ereunetes pusillus*.—Several seen during late September and early October; last noted on October 18.

WESTERN SANDPIPER, *Ereunetes maurii*.—Despite the supposed difficulty of identifying this species in the field, the writer wishes to record two Western Sandpipers from Deep Creek Lake in the large flock of shorebirds seen on September 20. Mrs. Brooks, Dorothy Brooks, and the writer were able to approach to within fifteen feet of these two birds, and they were in company with a single Least Sandpiper. The much heavier and longer bills, with a noticeable down-turn, were very evident in these two birds, and the suffusion of color on the breast made a continuous band instead of being broken as in the Semipalmated Sandpiper. We felt that conditions for observation could not have been much more favorable.

It should be noted that regular observations were not begun until September 13, and it seems reasonable to assume that the heaviest part of the shorebird flight may already have passed at that time. We expect to begin observations at an earlier date next season.—MAURICE BROOKS, *West Virginia University, Morgantown, W. Va.*

Waterbirds at Leetown, West Virginia.—At Leetown, Jefferson County, West Virginia, is located a federal fish hatchery. There are nine bass-rearing ponds and a reservoir, which together supply approximately thirty acres of open water. Besides these, there are many springs and small streams bordered with marshland. Although these ponds were not built until the summer of 1933, there is already a remarkable aquatic habitat established. The reservoir was made by damming a small ravine without cutting out the trees that grew there. As a result, the upper end is an elm-sycamore grove, standing in two feet of water. From July 30 until

August 30, several of the ponds were drained, exposing approximately five acres of mud flats. It is probably because of this favorable condition that so many shorebirds were seen. I visited the hatchery daily from April 9 until April 15, from July 30 until August 2, and from August 15 until September 9, 1936. The area was small enough for me to cover it rather thoroughly each day. Following is a list of the more interesting species noted. The estimated numbers of individuals appear in parentheses.

HORNED GREBE, *Colymbus auritus*.—April 9-12 (4); April 13 (12); April 14 (4).

PIED-BILLED GREBE, *Podilymbus podiceps podiceps*.—April 9-15 (2); August 30-September 8 (2).

GREAT BLUE HERON, *Ardea herodias herodias*.—August 21 (1).

AMERICAN EGRET, *Casmerodius albus egretta*.—August 19-22 (1); August 23-25 (2); August 27-29 (1).

EASTERN GREEN HERON, *Butorides virescens virescens*.—Common each day; probably nested.

BLACK-CROWNED NIGHT HERON, *Nycticorax nycticorax hoactli*.—August 20 (1), immature.

COMMON MALLARD, *Anas platyrhynchos platyrhynchos*.—April 9-15 (2); August 19-21 (2); August 22 (9), two adults and seven young; August 23 (2); August 27 (2). A nest was found by Surber in the summer of 1935.

COMMON BLACK DUCK, *Anas rubripes tristis*.—September 2 (1).

BALDPATE, *Mareca americana*.—April 9-11 (3); April 12-15 (8).

BLUE-WINGED TEAL, *Querquedula discors*.—April 9-15 (10); August 22-27 (1); August 28 (3); August 29-30 (4); August 31 (3); September 2-6 (7); September 8 (12).

WOOD DUCK, *Aix sponsa*.—August 20 (13); August 21 (24); August 22 (11); August 23 (19); August 24 (12); August 25 (1); August 26 (5).

RING-NECKED DUCK, *Nyroca collaris*.—April 9-15 (5), one male and four females.

GREATER SCAUP DUCK, *Nyroca marila*.—April 9-15, about fifteen each day.

BUFFLE-HEAD, *Charitonetta albeola*.—April 11-15 (1), female.

RED-BREASTED MERGANSER, *Mergus serrator*.—April 15 (3), all females.

KING RAIL, *Rallus elegans elegans*.—August 19 (1), immature; August 20 (2), immature; August 21 (1), immature; August 26 (1), adult; August 29 (1), Karl Haller collected one individual; September 7 (1), adult. This species evidently nested here this summer as none of the immatures could fly. Their wing feathers were still in sheaths.

VIRGINIA RAIL, *Rallus limicola limicola*.—August 19 (2), adults; August 20 (3), adult, immature, and juvenile. This species evidently nested as the juvenile could not yet fly.

SORA, *Porzana carolina*.—August 19 (3); August 20-21 (1); August 22 (3); August 23 (1); August 26 (1); August 27 (3); August 28-30 (1).

AMERICAN COOT, *Fulica americana americana*.—April 10-15 (1).

SEMPALMATED PLOVER, *Charadrius semipalmatus*.—August 19-24 (1); August 28-30 (1).

AMERICAN WOODCOCK, *Philohela minor*.—July 31 (1).

UPLAND PLOVER, *Bartramia longicauda*.—August 27 (1).

SPOTTED SANDPIPER, *Actitis macularia*.—Common each day; undoubtedly nested.

EASTERN SOLITARY SANDPIPER, *Tringa solitaria solitaria*.—Common each day.

GREATER YELLOW-LEGS, *Totanus melanoleucus*.—August 24-27 (1); August 30 (1).

LESSER YELLOW-LEGS, *Totanus flavipes*.—July 31-August 2 (15); August 19-27,

about five each day; August 29 (10), Karl Haller collected one individual; August 30–September 8, about three each day.

PECTORAL SANDPIPER, *Pisobia melanotos*.—July 31–August 2, about fifteen each day; August 19–28, about five each day; August 29 (15), Karl Haller collected one individual; August 30 (4). The most common shorebird during August.

LEAST SANDPIPER, *Pisobia minutilla*.—August 19–28, about four each day; August 29 (10), Karl Haller collected one individual; August 30 (3); August 31 (2); September 3 (1); September 6 (1).

SEMPALMATED SANDPIPER, *Ereunetes pusillus*.—July 31 (1); August 25 (2); August 27 (2); August 28 (1); August 29 (9), Karl Haller collected one individual; August 30 (3); August 31 (1); September 3 (2).

WESTERN SANDPIPER, *Ereunetes mauri*.—August 21, one seen at twenty-five feet with an eight-power glass. There were several Least Sandpipers beside it, and I compared the two species for half an hour. The points of identification noted were: the long, heavy, black bill; the gray coarsely marked upper parts; and the complete band of breast markings. So far as I know, this is the only record of the occurrence of this species in West Virginia. As a sight record it may stand until a specimen is taken.

BLACK TERN, *Chlidonias nigra surinamensis*.—August 15 (6), all in fall plumage.—J. LLOYD POLAND, Martinsburg, W. Va.

Heavy flight of waterfowl on Lake Lynn, West Virginia.—On October 23–24, 1936, occurred a very heavy flight of waterfowl in northern West Virginia, and the writer, together with Dorothy Brooks, Mr. and Mrs. Maurice Brooks, A. S. Margolin, and J. L. Poland, had opportunity to make careful observations on Lake Lynn, a large artificial lake in Monongalia County. Some hours were spent in making careful counts of selected segments in the flocks, so that the estimates of numbers given below represent something more than guesswork.

Large flocks of ducks were noted arriving on the stormy evening of October 23, but the birds were resting on October 24, a clear, bright day. Our estimate for the total number of individuals seen is about ten thousand on the two days. Most of the birds were in large flocks, one estimated to contain three thousand ducks. All the large flocks had departed on October 25. The species noted are listed below.

LOON, *Gavia immer*.—Four individuals noted.

PIED-BILLED GREBE, *Podilymbus podiceps podiceps*.—Five seen.

DOUBLE-CRESTED CORMORANT, *Phalacrocorax auritus auritus*.—On October 24, three of these birds were seen at Lake Lynn. Varying numbers of Double-crested Cormorants were about the lake constantly during late September, all of October, and into early November. As many as seven were seen at once.

WHISTLING SWAN, *Cygnus columbianus*.—Eight of these birds were resting on the lake just below the Ice's Ferry bridge on the morning of October 24. Four were adults and four young.

CANADA GOOSE, *Branta canadensis*.—Three flocks, including forty-five individuals, noted.

AMERICAN BRANT, *Branta bernicla hrota*.—With the Canada Geese noted above, was a flock of eight birds of this species. Definite notes of brant observations in West Virginia are very few, and this seems to be the only one within recent years.

MALLARD, *Anas platyrhynchos*.—Our estimate was 290 individuals.

BLACK DUCK, *Anas rubripes*.—About 850 seen. Some of those observed at close range had very red legs, and doubtless might be referable to *A. r. rubripes*. Others did not have noticeably red legs, and may have been *A. r. tristis*.

GADWALL, *Chaulelasmus streperus*.—About one hundred noted.

BALDPATE, *Mareca americana*.—We estimated 1275 birds of this species.

PINTAIL, *Dafila acuta*.—About seventy seen.

GREEN-WINGED TEAL, *Nettion carolinense*.—Two seen on October 24.

BLUE-WINGED TEAL, *Querquedula discors*.—About 200 in small flocks.

WOOD DUCK, *Aix sponsa*.—These birds were scattered throughout some of the larger flocks of ducks; we estimated at least one hundred individuals.

REDHEAD, *Nyroca americana*.—We counted 475.

RING-NECKED DUCK, *Nyroca collaris*.—About 400 individuals, the larger number on October 23.

CANVAS-BACK, *Nyroca valisineria*.—About 300, nearly all on October 24.

GREATER SCAUP DUCK, *Nyroca marila*; LESSER SCAUP DUCK, *Nyroca affinis*.—Among the 5400 individuals which we estimated were present, we saw a few well enough to determine that both scaups were present. Our impression was that *N. affinis* greatly outnumbered *N. marila*.

AMERICAN GOLDEN-EYE, *Glaucionetta clangula americana*.—Twenty-five noted.

BUFFLE-HEAD, *Charitonetta albeola*.—About fifty.

OLD-SQUAW, *Clangula hyemalis*.—Fifty-six individuals counted.

WHITE-WINGED SCOTER, *Melanitta deglandi*.—A number of individuals recorded in a separate note by Mr. Brooks.

RUDDY DUCK, *Erimatura jamaicensis rubida*.—About 450 birds of this species.

RED-BREADED MERGANSER, *Mergus serrator*.—One seen on October 24.

COOT, *Fulica americana americana*.—About one hundred seen.

In addition to the birds noted on Lake Lynn, large numbers of ducks, grebes, loons, coots, and shorebirds of various species were seen by the observers named above, and by I. B. Boggs, at Lake Terra Alta, Preston County, West Virginia, and at Mountain Lake and Deep Creek Lake, Garrett County, Maryland, on October, 23, 24, and 25.—JAMES T. HANDLAN, JR., *West Virginia University, Morgantown, W. Va.*

Notes from North Carolina.—AUDUBON'S SHEARWATER, *Puffinus lherminieri lherminieri*.—On August 11, 1936, Miss Roxie Collie, of the staff of the North Carolina State Museum, observed and identified a specimen of Audubon's Shearwater near the whistling buoy, about twenty miles southeast of the point of Cape Lookout, North Carolina.

SOOTY SHEARWATER, *Puffinus griseus*.—While crossing the sound on his way to fish for channel bass at Brown's Inlet, Onslow County, on September 7, 1935, the writer observed on the water directly ahead of the boat, a dark-colored bird that did not rise until the prow of the boat was within about five feet of it. As it rose into the fresh breeze coming through the Inlet direct from the sea, the boat passed almost directly below the flying bird, and it was definitely identified as a Sooty Shearwater. Another specimen of this species was collected on May 22, 1936, near New River Inlet, in the same county.

YELLOW-BILLED TROPIC-BIRD, *Phaethon lepturus catesbyi*.—Dr. H. F. Prytherch, Director of the U. S. Fisheries Biological Laboratory, Beaufort, North Carolina, while fishing for dolphin near the whistling buoy mentioned in the first paragraph, on August 3, 1936, observed and described a bird that could only be a specimen of the Yellow-billed Tropic-bird.

MAN-O'-WAR BIRD, *Fregata magnificens*.—In a letter to Harry T. Davis, of the State Museum, W. B. Keziah, editor of 'The Pilot', Southport, North Carolina, wrote under the date of September 27, 1935: "Following the recent threatened hur-

ricane, which did not strike here, we had scores of visitors in the shape of the beautiful Frigate Birds, or Man-o'-War Birds. They were pretty as they floated over the harbor." The reduced hurricane, to which reference is made, hit the lower North Carolina coast on September 5, 1935.

EUROPEAN WIDGEON, *Mareca penelope*.—On March 16, 1936, an adult male European Widgeon was collected for the State Museum on a marsh pond, near New River Inlet. The bird was not in company with other ducks.

KING EIDER, *Somateria spectabilis*.—An immature female King Eider was collected for the Museum on November 30, 1936. We regarded this specimen as a hybrid until its identity had been established by Dr. Alexander Wetmore, to whom the skin was submitted. The specimen was taken near New River Inlet.

BLUE GOOSE, *Chen caerulescens*.—An adult female, taken on February 3, 1935, and an immature female, on January 28, 1936, are additions to the previously recorded North Carolina specimens. The former was found dead on the salt marsh, with one side of the head eaten away. The immature bird was caught accidentally in a trap set for mink, and both specimens were secured on the lower part of New River, in Onslow County.—H. H. BRIMLEY, N. C. State Museum, Raleigh, North Carolina.

Additional records for St. Croix, Virgin Islands.—With the coming of the rains in the fall of 1936, abundant insects of flooded fields were eagerly sought after by northern shorebirds; the swallows appeared unheralded among us and might frequently be seen about their task. A number of specimens of unfamiliar birds were collected and later contributed to Dr. Stuart T. Danforth's collection at Mayaguez, Puerto Rico.

UPLAND PLOVER, *Bartramia longicauda*.—The Upland Plover was among the earliest visitors to arrive. A flock was observed scattered over an area of plowed land at estate Lower Love where several specimens were taken August 28, 1936. That was at the beginning of the rainy season and the birds were exceedingly fat.

SHORT-TAILED SWIFT, *Chaetura brachyura*.—A single specimen of this little swift was observed among a flock of about one hundred *Hirundo erythrogaster*. On the afternoon of August 28, 1936, I had an opportunity to collect it and the specimen was submitted to Danforth who made the determination remarking that subspecific characters, if any, are quite indefinite. It is interesting to speculate on just how the bird may have reached St. Croix in the fall of the year.

BANK SWALLOW, *Riparia riparia riparia*.—Five of these birds were observed and one was collected shortly after sunrise on October 20, 1936. They were associating with a flock of swallows comprising many *Petrochelidon* and a number of *Hirundo erythrogaster*.

NORTHERN CLIFF SWALLOW, *Petrochelidon albifrons albifrons*.—This swallow was first observed on October 20, 1936, with a flock of *Hirundo erythrogaster*. Since then they have been seen in several widely separated localities and their numbers variously estimated at from 25 to 70 individuals. On October 31, 1936, I collected a specimen at estate Lower Love.

CUBAN MARTIN, *Progne cryptoleuca*.—On one occasion in the month of June, 1936, I observed a strange martin among a flock of *Progne s. dominicensis*. The bird was conspicuously larger than the resident form and lacked the white under parts. Both of these characters should serve, I believe, in distinguishing it from the related forms and I place it here pending future observations and possibly the taking of a specimen.—HARRY A. BEATTY, Christiansted, St. Croix, Virgin Islands, U. S. A.

Notes from the Lower Rio Grande Valley.—The writer passed the period, November 7, 1936, to April 28, 1937, in the Brownsville region. Extracts from his notes, with regard to forms the status of which, in the light of previously published material, seems to have changed, are given below. A few other items of apparent interest are also presented.

LOON, *Gavia immer* (race?).—Dr. J. A. Hockaday, of Point Isabel, showed me a photograph of a mounted bird which he had shot at that place in the autumn of 1931. The specimen was destroyed in the hurricane which later visited that region.

EASTERN BROWN PELICAN, *Pelecanus occidentalis occidentalis*.—This species is decidedly not common now on that part of the Laguna Madre lying within Cameron County.

WATER TURKEY, *Anhinga anhinga*.—A group of from twenty to thirty birds, from which specimens were obtained by D. J. Bullock, was present near the southwestern border of Cameron County throughout the period covered by our observations.

AMERICAN EGRET, *Casmerodius albus egretta*.—This species, once reported rare and local, may be considered as fairly common at this time.

SNOWY EGRET, *Egretta thula thula*.—Outnumbering any other species of this order now to be found in the region, *Egretta thula* should figure as abundant.

ROSEATE SPOONBILL, *Ajaia ajaja*.—Local observers informed us that large numbers visited the "resacas" about the city in late summer. We saw but one, January 13, feeding with a mixed company of herons, egrets and ducks. When the birds flew the spoonbill joined a flock of Black Ducks and continued with it until it passed from view.

BLACK BRANT, *Branta nigricans*.—A bird of this species, not heretofore recorded from the region, was seen on the coastal plains, in company with three Lesser Snow Geese (*Chen hyperborea hyperborea*), November 18, 1936. One of the latter had a crippled leg and another was in immature plumage and scarcely larger than the brant. Except in the case of this oddly assorted group, seen within twenty-five yards of the highway, snow geese were difficult of approach. This quartet seemed loath to fly in the cold and rain and faced us directly where we stopped our car. The extensive black area on the breast and belly of the brant was advantageously observed.

WHITE-FRONTED GOOSE, *Anser albifrons albifrons*.—No longer a common winter resident. It was confidently looked for because of reports of its former abundance at this season but we saw it only twice. A flock of thirty, February 24, and a flock of six, March 16, were seen on the coastal prairies.

RED-LEGGED BLACK DUCK, *Anas rubripes rubripes*.—Not on all occasions were we able to get a satisfactory view of occasional flocks of Black Ducks; but a flock of about twenty, preening and resting on a ditch bank, January 13, was seen to have bright-red tarsi.

WHITE-TAILED KITE, *Elanus leucurus majusculus*.—Uncommon. The first one was seen January 31, after which a few were present up to the time of our departure. Our notes show that it was observed on eleven occasions and in four separate localities. On February 13, two were seen together.

AMERICAN ROUGH-LEGGED HAWK, *Buteo lagopus s. johannis*.—Dr. J. A. Hockaday, of Point Isabel, gave me a photograph of a mounted bird of this species which he had shot in that locality in the autumn of 1931. His collection, of which it was a part, was destroyed in the hurricane which later visited the region.

OSPREY, *Pandion haliaetus carolinensis*.—Seen but once, December 8, 1936, at Point Isabel.

APLOMADO FALCON, *Falco fusco-coerulescens septentrionalis*.—Dr. Hockaday

showed me a photograph of a mounted bird which he had shot in the autumn of 1931, the specimen itself having been destroyed. W. H. Blanchard, Audubon warden, told me that he had not seen this falcon for four years.

KING RAIL, *Rallus elegans elegans*.—One was seen March 19, 1937, some miles northwest of Point Isabel, in a freshwater ditch.

PIPING PLOVER, *Charadrius melodus*.—Noted on three occasions near Boca Chica beach, November 8, December 4 and March 18.

SNOWY PLOVER, *Charadrius nivosus* (race?).—One was recorded on the flats near Boca Chica beach, March 5, 1937.

AMERICAN GOLDEN PLOVER, *Pluvialis dominica dominica*.—One was seen March 19 and another March 29.

HUDSONIAN CURLEW, *Phaeopus hudsonicus*.—Flocks of from ten to fifteen were seen on the higher parts of the prairies, east and north of Brownsville, March 11, April 10, April 25 and 27. Specimens were obtained by Mr. Bullock, March 3.

EASTERN WILLET AND WESTERN WILLET, *Catoptrophorus semipalmatus semipalmatus* and *inornatus*.—Specimens obtained by Mr. Bullock in winter, March 5 and March 10, refer to the western form. Spring birds collected, April 10 and April 23, are referred to typical *semipalmatus*.

RED-BACKED SANDPIPER, *Pelidna alpina sakhalina*.—Not found to be uncommon after March 29. Prior to that date it was seen December 4 and March 19.

WILSON'S PHALAROPE, *Steganopus tricolor*.—Birds in full breeding plumage were seen April 25.

HERRING GULL, *Larus argentatus smithsonianus*.—Previously reported uncommon in winter, this species, in immature plumage was found everywhere, during the period of our residence in Brownsville. The city dump, the 'resacas,' the ponds of the coastal prairies and the gulf beach were its chief resorts.

BONAPARTE'S GULL, *Larus philadelphia*.—Apparently not previously noted in this region. One was seen, December 4, swimming in a prairie pond, not far from the gulf in company of a Ring-billed Gull. Another, swimming, was seen in the harbor at Point Isabel, February 13.

GROOVE-BILLED ANI, *Crotophaga sulcirostris sulcirostris*.—Seen in small groups—five to seven—November 19 to March 8. After this we saw none; but W. H. Blanchard tells me that the birds are not rare as breeders in the Brownsville area. Mr. Bullock reports a small flock present September 8, 1937.

BUFF-BELLIED HUMMINGBIRD, *Amazilia yucatenensis chalconota*.—Seen April 21 and 22, a pair in the garden. The bright red bill, common to several South American hummers, seems not to be mentioned in reference works describing the species.

DERBY FLYCATCHER, *Pitangus sulphuratus derbianus*.—A habit observed in the case of the Least Flycatcher, that of frequently preparing the nest some time in advance of occupancy, seems to be shared by the present species. A nest, complete, March 27, did not have a full set of five eggs until April 12. This date appears to represent an early laying.

WHITE-NECKED RAVEN, *Corvus cryptoleucus*.—The species was unprecedentedly abundant, according to local observers. It first appeared November 15 and individuals lingered until April 19. About the city dump there were hundreds. They were quite tame. One sat in a small mesquite, altogether unconcerned, while the observer stood at ten feet and talked to it for some minutes. The white at the base of the neck feathers, said to be concealed at all times, is frequently visible when a strong wind is blowing or when the bird, engaged in feeding on the ground, reaches well beneath its body to peck food held beneath its feet.

EASTERN BLUEBIRD, *Sialia sialis sialis*.—Seen regularly, November 13 to April 24. On the last date a pair was examining old woodpecker holes.

SHRIKE, *Lanius ludovicianus* (race?).—The Loggerhead Shrike was found to be abundant, November 7 to April 27. W. H. Blanchard, with field experience of more than thirty years in the region, tells me that he has never found a shrike's nest there. It is unlikely that he would have overlooked nests so conspicuous. Mr. Bullock reports that the species disappeared in May but returned by September 1.

RIO GRANDE VIREO, *Vireo griseus micrus*.—The finding of a nest of this species, with three eggs, on April 1, is presumably unusual. In another nest, found April 12, eggs had not yet been laid. In any event it is strange to northern experience to find a vireo nesting three weeks in advance of a raven. (The White-necked Raven did not depart for its nesting grounds until April 19.)

WORM-EATING WARBLER, *Helmitheros vermivorus*.—Not previously reported from the area as far as we have been able to discover. One was seen in the garden, April 13.

AUDUBON'S WARBLER, *Dendroica auduboni auduboni*.—The writer saw two on January 4 and one each on January 5 and February 5. Mr. Bullock collected one January 4.

CERULEAN WARBLER, *Dendroica cerulea*.—Seen but once, April 13.

RIO GRANDE MEADOWLARK, *Sturnella magna hoopesi*.—Mr. Bullock shot a number of meadowlarks which were examined by Dr. Max M. Peet of the University of Michigan and ascribed to this form.

WESTERN MEADOWLARK, *Sturnella neglecta*.—Encountered with certainty but once when a small perching flock was discovered, February 28. Our attention was drawn to them by their characteristic song.

SHARPE'S SEEDEATER, *Sporophila moreletii sharpei*.—Little has been published recently, regarding the breeding of this species. Two nests were found. In one case building began April 15, the nest was complete and contained one egg on the 22d and, on the 26th, there were three eggs, evidently a full clutch. Another nest with two eggs was found on the 26th; when revisited several days later, no eggs had been added. Nests were similar in situation, a few feet up in a slender shrub near the bank of a 'resaca.' They were composed chiefly of rootlets of a light-yellow color as were those described by Dr. Merrill in 1878.

LINCOLN'S SPARROW, *Melospiza lincolni lincolni*.—Astonishingly abundant and familiar. Occasionally, after rain, they could be seen drinking and bathing in puddles on street and sidewalk pavements, this, of course, in sections of the city outside the business district.—EDWARD R. FORD, *Chicago Academy of Sciences, Chicago, Illinois.*

RECENT LITERATURE

Groebbels' 'Der Vogel', vol. 2.—The first volume of this great work which appeared in 1932, was noticed in these pages (Auk, vol. 50, 246-247, 1933). All the praise accorded the first volume, which, in the intervening five years, has more than proved its usefulness as a work of the greatest value, as a stimulant, a guide, and a source book, may be equally given the present¹ somewhat smaller one. If anything, the present one, dealing as it does with sex and reproduction, including such popular topics as nesting, territory, care of eggs and young, etc., may prove to be the more widely consulted of the two volumes thus far issued.

The first section of the book is devoted to the biology of sex, including the following topics: sexual characters, the sex organs and other hormonal glands, the experimental approach to the study of secondary sex characters; genetic aspects—sex chromosome, sex-linked inheritance, etc. A conveniently arranged bibliography of approximately 600 references guides the reader to original source material.

The second section deals with reproduction behavior other than brood parasitism. This is the bulkiest part of the book and deals with the subject in both its general aspects and in great detail for individual species. Here there is a systematic as well as a biological treatment of data, making all the included material accessible from both points of view, a feature lacking in the first section. The behavioristic, physiological, chemical, anatomical, and embryological questions pertinent to the general field are taken up in full and, as in the first volume, the material is well digested and synthesized. The correlation and coordination of a vast quantity of data from many fields and sources is in itself a remarkable feat. The bibliography of this section totals 4032 references!

The third and last section of the book deals with brood parasitism, and forms one of the best single reviews of the whole subject yet published. A criticism in point here may be the failure to include the published observations and suggestions as to the existence of parasitism in the Birds of Paradise, inconclusive though they be, especially when we find included the relatively less pertinent data on the tyrannid *Legatus* which is not strictly a brood parasite in the usual sense, but a nest usurper. A few points regarding the parasitic habit in the weaverbirds (Ploceidae) also call for comment. *Anomalospiza* is erroneously called a fringillid. *Linura fischeri*, *Vidua hypocherina*, and *Steganura* are said to be parasitic on *Uraeginthus granatinus*, *Estrilda erythronotus*, and *Pytelia*, respectively. *Hypochera* is also said to parasitize *Pytelia*. The basis for these statements is Neunzig's paper in the *Journal für Ornithologie* for 1929, and Belcher's article in the *Beiträge zur Fortpflanzungsbiologie der Vögel* for 1930. If we go to these sources we find that Neunzig admits that nothing is known of the breeding habits of *Linura fischeri* or *Vidua hypochera* in a state of Nature, while Belcher's identifications of his supposed *Steganura* and *Hypochera* eggs in *Pytelia* nests are mere inferences. *Quelea quelea* is also said to be parasitic, but it is known to make its own nest and care for its eggs and young in normal fashion. Some 353 literature references accompany this part of the volume, which ends with an index to topics only; no index to species or authors is given.

It is hoped that this work, which, by its very nature can never be a "best seller," may be widely placed in libraries at all centers where serious ornithological work is done. No scientific investigator of bird biology can afford to do without it.—HERBERT FRIEDMANN.

¹ Groebbels, Franz. *Der Vogel*. II Band; Geschlecht und Fortpflanzung, xvi + 547 pp., 141 text-figs., 1937; Berlin, Gebrüder Borntraeger. Price \$13.05 (bound).

Portenko on the Bird Fauna of the North Urals.—This carefully worked out report¹ is based on the results of an expedition to the northern Urals in 1928, sent out by the Academy of Sciences of the U. S. S. R. and the Ural-Plan (Ural Planning Bureau) and forms a valuable contribution to northern Palearctic ornithology. Some 102 forms of birds were collected, two of which are described as new, *Tetrao urogallus obsoletus* and *Xylocopus minor neglectus*.

The author is inclined to ". . . consider the rôle of the Ural Mountains as a zoogeographical boundary to be greater than that of an ordinary boundary between districts and to ascribe to them the significance of a subprovincial boundary, i. e., approximately the same significance, in essence and equivalence, which Sushkin established for the Yenesei." However, his own discussion is apt to give the reader a quite contrary opinion. Thus, in speaking of his Riphean district, which represents the avifauna of the extra-polar part of the North Urals, the main object of his investigations, he writes, ". . . as regards the eastern boundary of the Riphean district we must make the following most interesting statement: that we do not know a single species of forest birds for whom this boundary serves as the limit of distribution either westward or eastward, thus once more emphasizing the Siberian character of the avifauna of the North Urals forests. It is impossible, at the same time, to deny the existence of this eastern boundary, as the Riphean district is a mountain territory, markedly differing in its general landscape and avifauna from the adjoining plains. This boundary is formed by the birds associated ecologically, on the one side, with mountains: dipper, black-throated hedgesparrow, ptarmigan; and on the other with flood-plains: grey laggoose, oystercatcher, and many others." The reviewer cannot help but interpret this as meaning that highland birds are in the mountains and lowland birds in the plains, but that the mountains are not a zoogeographic demarcation line in the strict sense of the word. This is further borne out by an ecological distributional study of the birds and the region, which brings the author to the following generalizations. The northern Urals have no summits covered with eternal snow; in the subalpine zone there is no belt of stunted 'creeping' trees; and in the zone of the true mountain forest there is no belt of deciduous trees. The bird fauna is very sparse and poor and is characterized not so much by zonal forms as by peculiar combinations of the species which likewise inhabit the neighboring plains. "The mountain avifauna of the Urals presents a not abundant, but varied mixture of intruders from different countries, which have colonized the mountain habitats of the Urals, devastated by glaciation and isolated by immense expanses of lowlands from other mountain chains. This is the reason of the peculiarities of the North-Urals avifauna taken on the whole. . . . the habitat of subalpine birch woods with hedgesparrows presents a phenomenon, which does not occur anywhere else. . . ." The author suggests that this last be termed the "North-Urals *Statio Prunello-Betuletum Subalpinum Riphæum*," a term too cumbersome to be likely to meet with wide acceptance.

The reviewer was reminded, while reading this ecological account, of the fact that in the mountains of Ethiopia where a similar lack of altitudinal vegetational belts is to be found, the lowland birds range high up to altitudes that otherwise would be far out of their range. Vegetation, with its concomitant factors of food supply, forms the barrier, not mere altitude (as expressed by temperature or barometric pressure).—HERBERT FRIEDMANN.

¹ Portenko, L. A. The bird fauna of the extra-polar part of the North Urals. Moscow, pp. i-viii and 1-240, 12 plates, 2 maps, 1937. In Russian with an English summary (pp. 223-240).

Johnston's 'Crooked-bill, the Life of a Quail.'—Crooked-bill, a Bob-white, is the hero of this nature story,¹ who roams the fields and woods of West Virginia with his companions, encountering most of the problems and experiencing, or witnessing, most of the disasters common to the quail tribe.

The author has endowed Crooked-bill and his companions with human attributes in this narrative, at the same time following the life history of the Bob-white, as revealed by the intensive investigations of recent years, as a foundation throughout. In the light of these investigations, however, some of the actions attributed to Crooked-bill and his covey mates do not ring true, though the behavior described has all been presented as fact in earlier quail biographies. For instance, Crooked-bill and Big Boy, another quail character, whistle the *bob-white* callnote while their mates incubate eggs nearby, though this note is now known to be the love call of the unmated cock birds which normally occur in from five to ten per cent surplus in the quail world. It is further recounted that only one bird, the old cock leader of the covey, whistles from the roost spot at break of day, when commonly or usually several birds whistle at once from each roost. The return of Crooked-bill from extensive wanderings to the location of his infancy, after an absence of months, implies a well-developed 'homing instinct,' while experimentation with Bob-whites indicates the contrary. Grace, a quail character, washes the bloody wing of Jane, another who has been injured, strange behavior for a Bob-white but possibly permissible in a story of this type.

Crooked-bill is of an investigative turn of mind in this story and in his wanderings encounters much of the animal life of his habitat. The observations on other creatures, most of which are birds, are presented in a pleasing, readable manner which will hold the interest of the average reader, young or old. Accuracy of several of the allusions may be questioned, however, among which the following seem most debatable: (1) It is implied that Cooper's Hawks habitually tear the wings of captured Bob-whites from the body to prevent escape before death occurs. In the reviewer's experience this has not been done in several instances where quail have been recovered from Cooper's Hawks immediately after capture. The wings have been intact, though heads and legs have usually been pulled off and swallowed before plucking of feathers from the body has been completed. (2) A Bob-white being swallowed by a blacksnake was covered with a slimy substance "that the snake had breathed on me so that it could swallow me." Creatures being swallowed by snakes are naturally covered by saliva during the swallowing process, it is not *breathed* on. But questionable statements like the above are not numerous enough to detract seriously from the story, which is generally presented in an attractive style. Allusions to the banding of birds by private individuals and in collaboration with the U. S. Biological Survey occur in several places and will aid the layman in an understanding of the purposes of that work.

The type of presentation employed has evoked considerable acrimonious debate in the past, and undoubtedly has a certain inherent weakness. In the eyes of the young or impressionable reader, horned owls, Cooper's Hawks, blacksnakes, foxes and other creatures preying on the humanized Bob-whites appear as murderers, the killing of which is a worthy aim in consequence. Other living creatures utilized by the humanized bird characters as food appear in a different light, and the luckless insect being hammered on the ground or dismembered evokes scant sympathy.

¹ Johnston, I. M. *Crooked-bill, the Life of a Quail* with a foreword by Ernest Thompson Seton. Illustrations from author's photographs. 8vo, 179 pp., 1937; Dorrance & Company, Inc., Philadelphia. Price \$2.10 postpaid.

Further, in this narrative the sportsman and his dog, when hunting our hero and his companions, are placed in a position sportsmen as a group cannot be expected to appreciate, especially as all death scenes are described so as to make them as harrowing as possible. The book will, however, be enjoyed by many to whom the matters pointed out may be of small moment.

There is a glossary of bird and plant names, the former at least of little value to the student as neither the technical nor the vernacular names are up to date while five of the first fifteen checked are incorrectly spelled.—H. L. STODDARD.

Makatsch on Brood-parasitism in the Cuckoos.—This little book¹ is a useful contribution to the literature of the European Cuckoo, *Cuculus canorus*, and the life-history material referring to that species is excellent. Unfortunately the author expanded his work to touch upon other parasitic birds with which he was not personally familiar, and as a result has made a number of mistakes which detract from an otherwise well-presented mass of data. We may dispose of these first as they really are side issues in the book and need not prejudice us against the main part of the work.

In discussing the cowbirds, he states their distribution is from southern North America to Patagonia, whereas, of course, the species *Molothrus ater* is known to breed as far north as the Athabasca country. An implication is made to the effect that the hosts of the parasitic weaverbirds lay white eggs similar to those of the parasites, although the chief victims of *Vidua macroura* in Ethiopia and Kenya Colony are species of *Cisticola*, whose eggs are decidedly spotted and speckled. It is definitely stated that *Hypochera chalybeata* is parasitic on *Lagonosticta* and that *Steganura paradisea* parasitizes *Pytelia*. The reviewer has been following the literature of the parasitic African weavers ever since his own field work with them in 1924 and 1925 and knows of no real, definite basis for either of these statements. In fact, there is more reason to believe, as far as the literature in such a subject is a help, that *Hypochera* may not be parasitic than that it is, although the reviewer has always suspected it of being a true brood-parasite! The Diplopterinae (= Taperinae) are referred to as being non-parasitic, although the only included species, *Tapera naevia*, is definitely known to be parasitic, a fact which the author refers to later on in his book. The Neomorphinae are likewise, and probably correctly, listed as non-parasitic cuckoos, but mention might have been made of the published material suggesting that *Dromococcyx phasianellus* may be a brood-parasite. Similarly it would not have been out of place to mention, even if only to refute, the implication of parasitism in the Birds of Paradise, made by Rothschild for *Phongammus keraudrenii* (Bull. British Ornith. Club, 51: 9, 1931). A few misspellings of scientific names, such as *Cossipha* for *Cossypha* (p. 103) and *Coccyzus erythrophthalmus* (p. 116) may be noted, and with these we may leave the matter of errors for the more inviting task of summarizing the mass of information Makatsch has compiled regarding one of the most written about and yet least understood birds in the world, the Common Cuckoo of Europe.

Besides his own observations the author has had access to many other observers' notes and specimens, and has combed the literature in a thoroughly adequate manner. We note that in a long and interesting discussion of the method of getting the egg into the nest, Makatsch is inclined to think that in some cases the birds may lay on the ground and then put the eggs into the nests with their bills, although he ad-

¹ Makatsch, Wolfgang. Der Brutparasitismus der Kuckucksvögel, mit besonderer Berücksichtigung von *Cuculus canorus canorus* L. Published by Quelle and Meyer, Leipzig, viii + 152 pp., 1 colored and 8 black-and-white plates, 1937. 10 Reichsmarks.

mits that in all cases where the egg-laying has actually been observed the egg was laid directly into the nest, even in some where there was only a small lateral entrance too small for the cuckoo to enter and actually sit on the nest. His position appears to be influenced by the fact that cuckoo's eggs have been found in nests seemingly impossible for a bird the size of the cuckoo to enter. This stand is backed by many of the best students of European birds and cannot be lightly dismissed.

Detailed lists of host species are given for each of nineteen areas in Germany, revealing some geographic differences in host frequencies, although the most commonly imposed-upon species are listed in most places, as might be expected. A total list of 125 hosts is given for *Cuculus canorus canorus*, 14 for *C. c. bangsi*, and 64 for *C. c. telephonus*. Shorter, incomplete lists are given for other African, Asiatic, and Australian cuckoos.

The similarity (or lack of it) between the eggs of the parasite and of its hosts is treated in detail and a colored plate showing cases of such similarity serves as a frontispiece. The writings of Baker, Jourdain, and others on this subject for both European and Asiatic cuckoos are discussed and the general inconclusiveness of many of the arguments is clearly demonstrated. On the whole, the author is impressed by the percentage of cases of egg similarity, and concludes by stating that species of parasitic cuckoos having many host species tend to produce more than a single general type of egg, a very fair statement of the case.

In discussing the matter of eviction of eggs or other nestlings by the young cuckoo, no explanation of the origin of the habit is definitely arrived at, but a rather indefinite suggestion is made by inferring that this habit occurs only, or chiefly, in cases where the young parasite and the young of the host are different in appearance, and not in cases where the two resemble each other fairly well. This of course, has no bearing on egg eviction, but only on nestling eviction.

The last chapter deals with the phylogenetic development of brood parasitism. The author considers the parasitic habit in the cuckoos to have started in some of the non-parasitic types when more than one female laid in the same nest, a thing that frequently happens. But the reason for the loss of the incubating and rearing instincts in the cuckoo he admits is still to be discovered. He reviews the various attempts to account for the cuckoo's present habits and shows wherein each of them fails wholly to satisfy. If the answer is ever to be found, it will come from a careful study of the cuckoos in intermediate stages, such as *Crotophaga*, *Dromococcyx*, *Geococcyx*, and from a comparative, accurate study of the different parasitic genera. Many years of intensive field work in various parts of the world are needed for this task. A bibliography of 592 titles completes the book.—HERBERT FRIEDMANN.

* William Brewster's 'Concord River.'—The warm welcome accorded 'October Farm' (reviewed in 'The Auk', vol. 54, p. 217, 1937) has encouraged the publication of this second series of excerpts from the manuscript journals of William Brewster, which were bequeathed by him to the Museum of Comparative Zoölogy. 'Concord River' is a slightly larger volume,¹ attractively gotten up, and well sustains the varied and delightful quality of the first series, as well from a literary point of view as from the naturalist's standpoint. In many cases the portions now presented include the full entries for various days and thus give not only a better picture of the method and purpose of the writer, but also provide a fuller insight into the heart and spiritual qualities of the man himself. Thus, from brief details mentioned in passing, we may picture Brewster year by year, tramping his familiar woods and fields, sailing

¹ Concord River | Selections from the Journals of | William Brewster | Edited by Smith O. Dexter. 8vo, vii + 258 pp., 12 pls., 1937; Harvard University Press, Cambridge, Mass. \$3.50.

over the placid waters of Concord River, or silently paddling his canoe along its marshy borders at sunset, intent on every sound or movement. Often the name of a congenial companion is mentioned. Always the commoner birds and other animals held his keen attention no less than the rarer visitors, while the beauties of trees, skies and landscape were to him a never-failing source of pleasure. To the notes and songs of birds his discriminating ear was especially attuned. It was characteristic of him that he should have been so moved by the singing of a particular Vesper Sparrow that he lay down on the turf at sunset to listen until it ceased. "One must be very near this bird," he wrote, "to get the best effect of its song. I know of no other sound in Nature which so rests and soothes me. It is like the touch of a soft hand and steals through all the senses, quieting the nerves and bringing peace and rest."

The many observations recorded in these pages deal with the habits of birds and other wildlife of the Concord region as he saw them in making the rounds of his familiar haunts for the more modern methods of detailed and laborious observation from blinds for hours on end, had hardly come into vogue until the later period of his life.

Of unusual interest in bird portraiture are the twelve full-page illustrations reproduced from water color and etching by Frank W. Benson, an artist whose exceptional skill is in depicting effect rather than precise detail. Best of these is perhaps the wedge of Wild Geese over the river marshes for it carries the spirit of the book; the Woodcock rising through brush bring back to mind the whirr of wings; the Black Duck coming in to the marsh at evening and the flock of Grackles in the grass are admirable. A few of the others convey to the reviewer, at least, a less happy impression; the Chickadees seem too listless, the winter Crows too dejected, while the rising Osprey looks a bit strange with its sharply pointed tail feathers.

The Foreword by Dr. Thomas Barbour, supplies interesting comments on the publication of these notes and on the comparison sometimes made between Brewster and Thoreau. An excellent index makes the subject matter easily available.—G. M. A.

Baerg's 'Elementary Ornithology' is a set of mimeographed notes bound in stiff covers, giving the substance of an outline course in general ornithology, the basis presumably of Professor Baerg's own lectures at the University of Arkansas. As outlined in the table of contents, an extremely brief history of the subject is given, after which are taken up fossil birds, the relationship of birds to reptiles, the value of birds, a short account of their structure and characteristics, their senses, songs, reproduction, flight, migrations, and other habits, with especial attention to certain species of general interest, followed by an appendix on food, and a key to the orders of land birds and the families of passerine birds, ending with a series of review questions. One might take exception to occasional statements or perhaps wish for more precise explanation, as where we are told that the Hoatzin is "a very perfect connecting link between reptiles and birds"; the use of "juvenile" for juvenal plumage is a mistake often made; and the inadvertent use of "auditory" for "olfactory" (p. 22) is an obvious slip. The author seems also to have confused *Hesperornis* and *Ichthyornis* in stating that the latter, having specialized in diving, had lost all power of flight. However, for teachers or others having in mind a course in general ornithology, this outline will serve as a suggestive and useful guide.—G. M. A.

¹ Baerg, W. J. *Elementary ornithology*. 70 pages, mimeographed, and in covers, copyright by the author, University of Arkansas, Fayetteville, Ark.

Friedmann on birds of Ethiopia.—After an interval of seven years, it is a satisfaction to record the publication of this second volume,¹ concluding Dr. Friedmann's summary report on the birds collected in Ethiopia by the late Dr. Edgar A. Mearns, who, after his work with the Roosevelt Expedition in 1909, extended his African experience as a member of Childs Frick's expedition to what was then Abyssinia. Through his skill and industry was secured the great collection of over 5200 birds, which forms the basis of the report, a monument to his ability as a collector.

One realizes on perusing the pages, that Africa's rich avifauna is now fast approaching that state where it may be described as fairly well known. It remains for the systematist to complete the 'mopping-up' process in working out the details of distribution and geographic variation and appraising the value and interrelationships of many of the named forms. Dr. Friedmann's own field experience in eastern Africa and his excellent knowledge of its avifauna have made possible the best use of the abundant material at his command. Although much good revisionary work is here given, the author points out again and again where further study of additional material is requisite for a final understanding of many points still obscure. It is characteristic of the field naturalist's work that even the most careful collecting may result in tantalizingly few specimens of many less-known species, and almost every expedition still brings back something additional of value.

In the account of the collection, for each of the forms treated, the original citation followed by a list of the specimens, precedes a brief discussion of the salient characters and relationships, and where possible, distributional maps and field notes are added. The summary chapter at the beginning of the volume contains much of general interest to the student of geographic distribution. The author finds that the ecological regions outlined by Dr. J. P. Chapin are upheld, while the views put forth by Lönnberg as to the history of the East African fauna receive confirmation. The gradual drying out of this portion of Africa since Miocene times, aided no doubt by the destructive efforts of man, has brought about in the course of centuries a wide break in what was once a continuous east-west belt of tropical forest with the resulting development of arid areas and an invasion by Asiatic types of vertebrates adapted to steppe life. Ethiopia itself rises above the surrounding area as a mountainous country with peaks reaching to over 15,000 feet. Here are found a small number of endemic forms, relicts probably, not occurring elsewhere. Since the mountains present no impassable barriers of an ecological nature, many lowland birds range high up on their slopes. A curious and unexplained fact is that many genera of birds of this northeastern corner of the continent reappear again in South Africa, but are absent from the intervening areas.

Such new forms as have been detected in the collections have already been described in preliminary papers, but some have since been found to be invalid. Thus our knowledge gradually becomes rounded out, as previous conclusions are reviewed in the light of wider experience, and, like a variable approaching a limit, slowly approximates the truth. A colored plate of *Ploceus fricki* and a series of halftone plates illustrating various characteristic types of environment, add to the value of the account, while a thorough index renders the subject matter readily available.—G. M. A.

Mills's 'Bugs, Birds and Blizzards'.—When in a single summer more than twenty thousand tourists visit the Yellowstone National Park, make excursions to

¹ Friedmann, Herbert. Birds collected by the Childs Frick expedition to Ethiopia and Kenya Colony. Bull. U. S. Nat. Mus., no. 153, xli + 506 pp., 14 pls. (1 col.), 30 text-figs., 1937. Price 70 cents, Superintendent of Documents, Washington, D. C.

its various points of interest, wait to catch a glimpse of its wild sheep, deer, bear, and many birds, stop to listen to the evening lecture by the Park Naturalist, and depart with an awakened enthusiasm in what they have seen and heard, it is evident that there is a growing interest in natural beauty and wildlife. This booklet,¹ prepared by a former Park Naturalist, may well serve these visitors as a reminder of their tour. It deals mainly, however, with the winter aspects of the Yellowstone region and is written in a spirit of keen enthusiasm for its varied and interesting phenomena. The snow insects, the large game mammals, the many birds, the magnificence of the snowclad ranges come vividly before the reader. While there is little of unusual scientific importance in its pages, a few points are worth mentioning, such as the actions of a pair of nesting Red-tailed Hawks in driving a Bald Eagle away from their territory, the robbing of a Short-eared Owl of its prey (a meadow mouse) by a Marsh Hawk, the status of the Trumpeter Swan which here finds a year-round sanctuary; two excellent photographs belonging to the National Park Service show an adult pair and their brood of cygnets. A new departure in binding is provided by the novel method of wire loops which permit the pages to lie flat when open like a student's notebook.—G. M. A.

Bennitt and Nagel on resident game and furbearers of Missouri.—Considering that the authors together expended less than a year and a half in the actual work on this report, they have brought together in this preliminary survey² of the game animals of Missouri an astonishing amount of pertinent facts that may serve as a basis of future efforts toward a wiser use of these natural resources within the State.

During the first half of the nineteenth century, which covers the period of settlement by white men, the bison, wapiti, pronghorn antelope, black bear and cougar were practically eliminated from the State. In the second half of the century the destruction of forests, draining of marshes and cultivation of prairie lands profoundly affected the native fauna; while in the following years the development of market shooting and of hunting as a sport resulted in the further decimation of other species. The game birds treated are the Eastern Bob-white, Ruffed Grouse, Prairie Chicken, Eastern Wild Turkey, Ring-necked Pheasant and Mourning Dove. The range requirements of each, and the relations to predators and especially to man are taken up, with discussion of present and past status in Missouri. For Bob-white it is estimated that the average annual kill by man is one half the autumn population; Ruffed Grouse, once abundant, are now all but gone; the Prairie Chicken still persists in scattered areas, but in greatly decreasing numbers; while the Wild Turkey, so abundant a century ago that a four-horse load of these and other game went "twice a week from Bourbon to St. Louis," now numbers an estimated population of about 3500 birds. The Passenger Pigeon disappeared a half century or more ago. For the native ducks and upland game the story is much the same. Altogether the white man's effect on the larger species is one of appalling destruction.

The report embodies recommendations for increased protection and artificial propagation for certain species, that may or may not help to stave off the day when they will cease to exist in Missouri. Although one cannot read these pages without grave misgivings for future prospects, he may nevertheless find encouragement in the fact that these matters are now so clearly brought to view. The estimates of

¹ Mills, Harlow B. 'Bugs, Birds and Blizzards in the Yellowstone.' 8vo, vii + 76 pp., 8 pls., Collegiate Press, Inc., Ames, Iowa, 1937. Price Fifty Cents.

² Bennitt, Rudolf, and Nagel, Werner O. 'A survey of the resident game and furbearers of Missouri.' Univ. of Missouri Studies, 12: no. 2, 8 + 215 pp., 8 text-figs., 10 maps, April 1, 1937. \$1.25.

population and relation to annual kill seem to have been made with care and should prove of value as a basis for protective measures. Such a survey as this, imperfect as it may be, is a long step in the direction toward a more intelligent program of wildlife conservation.—G. M. A.

Linsdale's 'Natural History of the Magpies.'—In this monograph¹ are gathered together not only the author's own extensive notes on American magpies, but also the scattered literature on the habits of these and of the Old World species as well. Especial attention is given throughout the paper to the Yellow-billed Magpie (*Pica nuttalli*) with which the author is best acquainted, a species first described a century ago by Audubon from specimens obtained near Santa Barbara, California, by Thomas Nuttall.

The genus *Pica* is distinctly a north-temperate one. Of the seventeen forms treated, ten are Asiatic, four are chiefly European, one occurs in northwestern Africa and two are North American. Of those in the Old World, the northwest African bird is regarded as a distinct species, as is also *Pica bottanensis* of Sikkim to eastern Tibet, while all the others are currently considered races of *Pica pica*, as is also the Black-billed Magpie of North America. No attempt has been made, however, to review critically the taxonomic status of the Old World forms.

The Yellow-billed Magpie is one of the few American species of birds whose range is entirely confined to the State of California, where it is chiefly found in the central coast region and the adjacent San Joaquin and Sacramento valleys. Even here, its status has changed considerably within historic times, as a result of changes in agricultural practices. By contrast, the American Black-billed Magpie extends only to the northeastern borders of California, whence it ranges eastward to the Mississippi valley and in a coastal area northward to southern and western Alaska. Both are regarded as derivatives from Asiatic stock, perhaps in early Pleistocene times. Whereas the Yellow-billed Magpie requires a certain amount of forest growth with open spaces as of cultivated fields, and a uniform climate lacking high winds and cold winters, the Black-billed species is more a bird of thorny, scrubby vegetation and a cooler, more varied climate. Both are birds of weak flight. The survival of the former may be in part due to an apparent lack of predacious enemies, whereas the latter, at least in immature stages, is a frequent prey of various hawks.

In fourteen chapters sundry phases of the biology of magpies are treated, their distribution, habitat relations, food, migration, nesting, young, plumages, anatomy, general habits, populations and relations to other animals, including man, and frequent comparison is made between American and Old World birds. A remarkable habit both in America and in the Old World is that of other birds in utilizing abandoned or even fresh nests of magpies for their own purposes. Sparrow Hawks particularly seem so inclined.

A very brief summary chapter gives the gist of the mass of published details here brought together, yet it leaves the reader with the impression that a great deal remains to be filled in before the biology of the magpies is really understood. A series of excellent figures illustrates the development of the feathering in the young bird as well as characteristic poses of the conspicuous adults. Nor is the importance of folklore, representing the beginnings of natural-history observation, forgotten. There is a well-prepared bibliography covering twenty-four pages of small print, in which the important literature is included. Altogether this monograph forms an

¹ Linsdale, Jean M. 'The natural history of the magpies.' Pacific Coast Avifauna (Cooper Ornithological Club), no. 25, pp. 1-124, pls. 1-8, col. frontispiece, text-figs. 1-20, August 24, 1937.

excellent summary of our present knowledge of magpies, and affords a solid basis for further studies of their habits.—G. M. A.

Brewster's 'Birds of the Lake Umbagog region,' part 3.—At his death in 1919, William Brewster left uncompleted the manuscript which he had for many years been preparing on the birds of the Lake Umbagog region of Maine. Nearly half of the work, however, was in such shape as to permit the publication of two parts which appeared in 1924 and 1925, respectively, as numbers 1 and 2 of volume 66 of the 'Bulletin' of the Museum of Comparative Zoology. Now the third part,¹ edited by Mr. Ludlow Griscom, carries it forward and comprises the accounts of the cuckoos, kingfisher, hummingbird, and woodpeckers to the flycatchers, jays and grackles. The text is essentially as left by Brewster himself except that the accounts of the Canada Jay and the Bronzed Grackle have been compiled by the editor from the journals and notes.

The treatment is similar to that of the preceding sections, with for each species a narrative account of its general status and habits in the region, followed by extensive quotations from the journals concerning various incidents of especial interest. These are replete with valuable notes on little-known or rarely mentioned habits, gathered in the course of many years' experience, for Brewster used his unusual opportunities to full advantage. The work is of particular value as presenting a vivid and detailed picture of the bird life of what even in the final quarter of the last century was still a primeval northern wilderness, the avifauna of which was imperfectly known. To later generations of ornithologists these notes will be of increasing interest for comparison with the changed conditions of the present day, resulting from destructive activities of mankind. A final part, including the remaining passeriform birds is projected by the editor to complete this work.—G. M. A.

PERIODICAL LITERATURE

ALDRICH, JOHN W., AND BOLE, BENJAMIN P., JR. The birds and mammals of the western slope of the Azuero peninsula (Republic of Panama). Sci. Publ. Cleveland Mus. Nat. Hist., 7: 1-196, 8 pls., map, Aug. 31, 1937.—The Azuero peninsula projects into the Pacific Ocean from the southern part of Panama. It includes a mountain ridge running at right angles to the main cordillera, and separated from it by low country, while in the southeastern portion is a second mountain mass. In the report (by Aldrich) on birds collected here, comparisons show that several local races may be distinguished, which are described as new: *Tinamus major brunneiventris*, *Crypturornis soui poliocephalus*, *Ortalis garrula olivacea*, *Chaetura vauxi ochropygia*, *Sittasomus griseicapillus veraguensis*, *Manacus aurantiacus flaviventris*, *Elaenia flavogastra pallidorsalis*, *Habia rubica aurantiicapilla*, *Atlapetes gularis azuerensis*. Critical notes on many of the species are given; in addition the material shows the distinctness of the Coast Rican woodpecker, here described as *Centurus rubricapillus costaricensis*. The single Turkey Vulture preserved proves to be the western bird, lately named *Cathartes aura teter*, confirming Chapman's view that the winter Turkey Vultures of Panama are in part migrants from farther north. The ranges of the races of *Buteogallus anthracinus* are tentatively worked out. Lesson's Motmot, usually regarded as a bird of the subtropical zone, was found to occur down to sea level.

¹ Brewster, William. 'The birds of the Lake Umbagog region of Maine.' Bull. Mus. Comp. Zoology, vol. 66, pt. 3, pp. 403-521, November 1937. \$1.50.

- ANDERSON, R. M. Mammals and birds of the western arctic district, Northwest Territories, Canada. Canada's Western Northland, Ottawa, p. 97-122, map, July 9, 1937.—Several pages are devoted to an analysis of the avifauna of the western arctic and subarctic regions of Canada. Many geese and ducks breed in the lake and marsh regions, especially of the Mackenzie valley. The greater area to the eastward with its clear lakes provides little duck-food and hence is comparatively unimportant as a duck-breeding region. The absence of murre, puffins, auks and auklets from the western arctic of Canada is striking, and to be correlated with the fact that these coasts are low and afford no cliffs such as the birds require for nesting, nor do they penetrate the arctic archipelago far enough to reach the rocky ledges of the Coronation Gulf region, which except for a few gull rookeries, is singularly lacking in seabirds. As a food species the Willow and the Rock Ptarmigan are perhaps the most important of arctic birds from the human point of view.
- BAZUIN, CLAYTON. A new Arkansas Kingbird record for Michigan. Jack-Pine Warbler (Bull. Michigan Audubon Soc.), 25: no. 3, 21, July 1937.—The first known nesting of the Arkansas Kingbird in Michigan is here recorded. A pair was found on June 30, 1937, nesting in an oak tree near Delton, Barry County. The birds were later observed by various other competent ornithologists.
- BIGALKE, R. The naturalization of animals, with special reference to South Africa. South African Journ. Sci., 33: 46-63, March, 1937.—This article refers to some of the more striking (usually disastrous) results of animal introductions in various parts of the world and records all known cases for animals of all groups in South Africa. The birds that have been established include the English Sparrow, Indian Mynah, European Starling, and Chaffinch, extensively, and the Song Thrush and Ring-necked Pheasant on a lesser scale. Introductions are objected to not only on account of the material losses which they may cause but also on account of their vitiating the native fauna. The only sorts countenanced are those making good actual deficiencies in the fauna and those needed in connection with the biological control of pests. The article has a bibliography of some 60 titles.—W. L. M.
- BODENSTEIN, G., AND SCHÜTZ, E. Rossittener Heringmöwe (*Larus f. fuscus*) am Victoria-See (Ostafrika). Der Vogelzug, 8: 61-62, 1937.—A case has previously been reported of a Gray Gull banded in Finnland being retaken on the Congo in equatorial Africa. Here a second case is put on record of a young bird banded at the Rossitten Station, as a migrant on October 14, 1936, and found dead on the north coast of Lake Victoria, central Kavirondo district, on January 2 following.
- BOGERT, CARDINE. Birds collected during the Whitney South Sea Expedition. XXXIV. The distribution and the migration of the Long-tailed Cuckoo (*Urodynamis taitei* Sparrman). Amer. Mus. Novitates, no. 993, 12 pp., July 6, 1937.—From data now available the remarkable migration of the Long-tailed Cuckoo is here mapped out. From its breeding area in New Zealand, it migrates northward in the southern autumn to certain of the island groups of the South Seas, chiefly between 5° and 25° south of the equator. At this period it is accidental on the Chatham and Kermadec group and Auckland Island, but winters regularly in Melanesia, Micronesia (as far west as Palau) and Polynesia (as far east as the Marquesas). By November the birds return to New Zealand, the males slightly preceding, and start mating. Eggs are laid in November and December, and young appear in January and February. In March they gather in small groups and set off on their migration northward. Fifteen species of fourteen genera of New Zealand birds are known to be parasitized by this cuckoo.

A list of these birds, a history of the development of our knowledge of the species, and a map showing breeding and wintering areas are given.

- Box, HAROLD E. Observations on wild cotton in birds' nests in Antigua. *Tropical Agriculture* 14(9): 254-255, 1 pl., Sept. 1937.—Golden Warblers (*Dendroica petechia bartholemica*) and Honey Creepers (*Coereba dominicana*) freely use the lint (including seeds) of wild cotton in building their nests. This plant is regarded as a weed in relation to Sea Island cotton and contributes to the maintenance of insect pests of the cultivated species. The cotton nests become sanctuaries for some of these insects including the highly destructive pink bollworm.—W. L. M.
- BROOKS, ALLAN. Thayer's Gull (*Larus argentatus thayeri*) on the Pacific Coast. *The Murrelet*, 18: 19-21, Sept. 4, 1937.—The history of the discovery of this bird is briefly given. It winters regularly and in numbers on the coast of British Columbia to southern California, but how it reaches this area from its breeding grounds in eastern arctic America is unknown. Living birds show several important distinctions as compared with the common Herring Gull, which occurs in smaller numbers on the same coasts in winter. The straw-colored iris is thickly peppered with brown or grayish specks instead of being clear; the eyelids are always purplish pink instead of yellow to orange red; the bill is paler yellow to greenish. From Kumlien's Gull it differs in its larger bill, darker wing tips and especially in the color of the eyelids which in the latter species is dark scarlet red in adults at all seasons. Thayer's Gull is common on the British Columbia coasts from October to late April.
- CHAMBERLAIN, E. B. Seasonal list of South Carolina birds. Charleston Mus. Leaflet, no. 8, p. 1-21 [1937].—This leaflet provides a summary list of the birds of South Carolina, mainly nominal or with very brief notation of occurrence. The species are arranged in the following groups: permanent residents, 104 species; summer residents, 58 species; winter visitors, 105 species; transient visitors, 51 species; accidental or casual visitors, 55 species; a total of 373 for the State. In addition there is a hypothetical list of 26 species, for one of which, the King Eider, the author has in the interim published an authentic record.
- CLELAND, J. BURTON. The history of ornithology in South Australia. Part III. The Emu, 37: 33-47, July 1, 1937.—Continuing the review of early exploration and ornithological work in South Australia, brief accounts are given of the routes and bird observations on expeditions from 1891 (The Elder Exploring Expedition) down to 1907 (cruise of the 'Governor Musgrave'), followed by brief notes on the later history of ornithology in this region. Of special interest are notes on the famous Horn Expedition to central Australia. The value of certain species of birds as water indicators in desert country has more than once proved of timely aid to thirsty explorers, especially crows, Chestnut-eared Finches and Emus. Emus will scratch holes in the sand to obtain water and the crows frequently indicate the proximity of natives, often an important matter, so that in this way birds have played a part in the success of expeditions and probably also in the saving of lives.
- COOKE, MAY THACHER. Flight speed of birds. *Circ. U. S. Dept. Agric.*, no. 428, p. 1-14, May 1937.—A summary table is given of various flying-speed records for slightly over one hundred species, chiefly North American birds. The greater part of these were ascertained by means of the speedometer of an automobile following the birds. Variations in speed may arise from a variety of causes, such as force of wind, the age of the bird, or the state of its plumage. The highest on the list is the Duck Hawk, credited with a speed of from 165 to 180 miles per

hour, as determined both by stop-watch and by airplane tests. Various ducks may attain over fifty miles an hour, the Golden Plover seventy miles. The Ruby-throated Hummingbird may fly at from 45 to 55 miles per hour, but the average of most passerine birds is much less, even the Barn Swallow scarcely exceeding 42 miles. The European Starling is one of the rapid fliers, for several measurements show that its usual rate is at least from 25 to 30, and may frequently exceed 45 miles. A few data are added on the running speed of five species, the swiftest of which is the Australian Emu paced by automobile to 31 miles an hour, while the Road-runner in California has similarly been found to run at a rate of from 15 to 20 miles per hour.

CRANDALL, LEE S. Further notes on certain Birds of Paradise. *Zoologica* (N. Y. Zool. Soc.), 22: 193-195, 1937.—The display of the Red Bird of Paradise is described. Although male birds in captivity were kept under observation for several years, no display was seen until March 1937, when by a fortunate chance a new perch having a slanting branch extending downward from the trunk at an angle of about 45 degrees was introduced. This slanting branch seemed to take an important part in the display. Standing with his body held stiffly parallel to the perch, with the head plumage fully distended, a male bird then moved the wings slightly away from his body, and vibrated them rapidly. Then jerking the body erect, the vibrating continued. Next, lowering his body, he started down the slanting branch to its end, where he remained for some twenty seconds, the head lower than the tail, the wings slightly spread and vibrating. The plumes filled the space between wings and tail. It seems very likely that the slanting perch is necessary for the performance. Moulting requires four months. In the Twelve-wired Bird of Paradise the average moulting period is three months. Seven years were required for the development of the complete adult plumage in birds at the New York Zoological Gardens. The display of the green breastplate and the flank plumes is accompanied by a sidewise leap from the perch to the adjacent trunk of the perch, which the bird seized with its powerful feet and turned slowly around it. When the turn had been completed it leaped back to the branch from which it started. The great grasping power of the feet may be correlated with the unusual development of the short muscles of the metatarsus.

CURTIS, ELIZABETH L. Comparative weights of live birds. *The Murrelet*, 18: 29, Sept. 4, 1937.—In tabular form the weights of seventeen species are given in grams, ranging from that of the Rufous Hummingbird, 2.85 grams, to that of the Cooper's Hawk, female, 355.8 grams. Various species include western forms of wren, thrush, towhee, robin, jay and flicker. Each bird, when captured for banding, was slipped into a paper bag, and the whole then quickly weighed.

DANFORTH, C. H. An experimental study of plumage in Reeves Pheasants. *Journ. Exper. Zool.*, 77: 1-11, 2 text-figs., 1937.—Shows that there are marked differences between this pheasant and the Common Fowl in the mechanism for controlling secondary sex characters in plumage. By the time of hatching, feather follicles of the male and of the female pheasant have acquired distinctive potentialities that persist throughout later life. In the Common Fowl the feather follicles of males and females are supposed to react identically to the same hormonal influences although some doubt has been cast on this in the little-known paper of Matsu's.—E. MAYR.

ERRINGTON, PAUL L., AND HAMERSTROM, F. M., JR. The evaluation of nesting losses and juvenile mortality of the Ring-necked Pheasant. *Journ. Wildlife Management*, 1: 3-20, July 1937.—Typically, the hen Ring-necked Pheasant

brings off but a single brood a year, but if disaster overtakes the first laying of eggs, the bird will make a second attempt. In a total of 445 nests under observation in Iowa between 1933 and 1935, seventy-seven per cent were unsuccessful. Allowing for various unusual factors brings the loss down to fifty-nine per cent. Large as this loss seems, it is partly made up by second nestings. Hypothetically, one hundred hens should bring off between 631+ and 697+ young in a season. As a check on this figure, at the termination of the nesting season 106 hen pheasants were found to have a total of 441 young.

GROTE, H. Zur Fortpflanzungsbiologie einiger Strandläuferarten (*Calidris*). Beitr. z. Fortpflanzungsbiol. d. Vögel, 13: 127-132, July 1937.—Notes on the breeding habits of six Old World species of this genus of sandpipers, especially the courtship display and its duration as well as the part each sex plays in the care of the eggs and young. In *C. minuta* the female apparently assumes the chief part in incubation; in *C. temminckii* the male seems to be more active in taking a part in these duties. In the case of *C. testacea*, both parents share in the nesting and are seen accompanying their downy young. On the other hand, in two cases where *C. tenuirostris* was observed, a single bird alone was found incubating, and one of these when collected proved to be a male while the other was presumed to be of that sex.

GUGGISBERG, C. A. W. Auf den Vogelinseln von Pembrokeshire 26 April-2 Mai 1937. Der Ornith. Beobachter, L'Ornithologiste, 34: 192-203, pls. 1-3, 4 text-figs., 1937.—As a guest of Mr. Lockley, the author spent a week at the bird sanctuaries of the islands Skokholm and Grassholm, off the southwest coast of Wales, and gives a brief account of the seabirds nesting there. Two Fulmars were seen and Lockley believes that in the course of a few years more they will nest on the islands. In 1894, Fulmars were rare visitors in autumn and winter and till 1878 St. Kilda in the Hebrides formed their southernmost breeding station. Later they suddenly increased their area of distribution, when about 1900 the first colonies were established on the English coast. From 1910 on, they began nesting on the coast of Ireland. On Skokholm is a large breeding colony of Manx Shearwaters with which in 1936 Lockley made the following experiments, using banded birds. A bird taken to South Devon was back at its nest shortly before midnight the same day. A second bird carried six hundred miles north and a third taken to the Färoe Islands and released, were retaken in their nest burrows on his return to the island a fortnight later. Two others taken to the Firth of Forth were both retaken at their burrows some days after. These and the nesting petrels doubtless owe their escape from predatory gulls to their nocturnal and hole-nesting habits. Oyster-catchers proved to be somewhat active by night. The island of Grassholm is inhabited by a fine colony of Gannets. In 1886 the nesting birds numbered some 250 birds, but a photographic survey in 1933 showed that this number had increased as a result of careful protection to about 4750 breeding pairs.

HANN, HARRY W. Life history of the Oven-bird in southern Michigan. Wilson Bull., 49: 145-237, pl. 1-11, Sept. 1937.—This intensive study has chiefly to do with the nesting activities of the Oven-bird. Locally breeding males are among the first to arrive in spring, while females are from nine to fourteen days later. The birds reoccupy their old territories while new birds occupy the remaining space. Territories vary in size from half an acre to about four and a half acres. Copulation between non-mated birds is common and in two cases males had two mates each. Flight song is commoner toward evening. The average incubation period is twelve days and five hours. Eggs are piped from fifteen to twenty

hours before hatching. The young are more precocial than those of most passerines, leaving the nest at eight days of age. They pass through four stages: a hopping stage, for at first they progress in this way and gradually learn to run; the early flying stage, from the eleventh to twentieth day after leaving the nest; a semi-dependent stage in the following ten days in which they begin to pick up food for themselves; and an independent stage, from this time to about the fortieth day, when they have attained their first-year plumage and are ready to migrate. Less than half (43.5 per cent) of the eggs produced young that left the nest while the number of young that mature sufficiently to leave the woods was estimated to be hardly a quarter of the total number of eggs laid. About half the nests were parasitized by the Cowbird, resulting in a loss of about 18 per cent of the number of eggs, chiefly through the removal of eggs by the Cowbird. Out of forty Cowbird eggs, probably not more than five young reached the age when they left the woods, so that the Oven-bird is not a very favorable host.

HERMS, W. B., AND KADNER, C. G. The louse fly, *Lynchia fusca*, parasite of the owl, *Bubo virginianus pacificus*, a new vector of malaria of the California Valley Quail. Journ. Parasitol., 23: 296-297, June 1937.—Positive results in experiments show that this fly can transmit quail malaria caused by *Haemoproteus lophortyx*.

HICKS, LAWRENCE E. The breeding birds of unglaciated Ohio. The Cardinal, 4: 125-141, 2 pls., July 1937.—In this analysis of the avifauna of Ohio, the author finds that the Chuck-will's-widow is the only species that is limited in the State to the unglaciated southeastern portion. The dominant forest trees are oak, chestnut and hickory. Of the 183 species that breed in Ohio, 130 are found nesting in the unglaciated area. Of these, only six are confined to the more southern parts as breeding birds. The northern conifer forest is almost unrepresented in the unglaciated area, and there are no true bogs with bog flora. Though hemlock grows sparingly in every county, it is only in a few places that it is common enough to influence the bird population.

HOESCH, W. Brut- und Mauserbeobachtungen an verschiedenen *Lophoceros*-Arten. Ornith. Monatsber., 45: 106-114, 4 text-figs., July 8, 1937.—Interesting notes are presented on the nesting habits of four species of the smaller hornbills (*Lophoceros*) of the arid country of Southwest Africa. Two species (*L. nasutus* and *L. bradfieldi*) breed in rock crevices of cliffs; *L. flavirostris leucomelas* and *L. montei* nest in hollows of trees. The food of *L. bradfieldi* consists of various larger insects, small reptiles and fruits. Breeding males can be distinguished in the field by the worn feathers of the tail, which is used as a prop to support the bird while feeding the incubating female at the nest-hole. This last is walled up except for a narrow slit. The breeding female then proceeds to moult, losing the wing and tail feathers almost simultaneously. A nest of *L. flavirostris leucomelas* in a hollow tree consisted, when opened from below, of about two liters of bits of bark, but contained no eggs, although it had evidently been walled up for some while. On the following day the female was found to have broken her way out, and though partly moulted, was still capable of flight. The birds remained in the vicinity and in about three weeks the female was again immolated, and on opening the nest from below three weeks later, three slightly incubated eggs were found, which later proved infertile, probably because of the interruption of the nesting cycle.

HOLLOM, P. A. D. Observations on the courtship and mating of the Smew. British Birds, 31: 106-111, fig. 1-5, Sept. 1, 1937.—The little-known display of the male Smew is carefully described as observed on reservoirs in Surrey and Middlesex.

Courting was first seen on December 27 and continued until about the third week of February, diminishing in intensity in the latter part of the period. The display begins with the erection of the crest on the forehead. The head is then drawn in and back against the neck, and the breast is puffed out. In a few seconds the head and neck may be jerked forward. If sufficiently excited, the male then rears up on the water from time to time, with the bill open and shaken from side to side. Only a few times was a drake seen to follow this by pointing the bill upward, nor was one seen to throw the head back as Millais has depicted. An action common to both sexes was pointing the bill to the water as if to drink, then raising it upward. The female has also a bobbing action in which the head is pointed vertically down against the breast, after which the bird bobs quickly upward several times in succession. The mating actions are described in detail. In this the duck seems to take the initiative, extending her head just above the water. The drake may or may not respond, nor are his courtship actions an immediate prelude to copulation. The early season of year in which the courtship takes place is remarkable.

JOURDAIN, REV. F. C. R. The so-called "injury-feigning" in birds. III. The Oologists' Record, 17: 14-16, March 1937.—In this further compilation of records of birds resorting to "injury-feigning" tactics when their nests are approached, an especially interesting case is that of the Short-eared Owl as observed by C. E. Baker in Orkney. The bird alternately used threatening actions, clapping its wings and calling while circling about in the air, then as the observers remained watching, would "side-slip" to the ground and flutter as if helpless. The first set of actions belongs to the "attacking" group, the second is usual with a dangerous enemy that cannot be intimidated but may be enticed away by signs of apparent weakness. Thus it may appear that the bird has the power of discriminating between dangerous and relatively harmless intruders.

LÉPINEY, —, AND NÉMETH, —. [On the high-mountain fauna of the Great Atlas.] Bull. Soc. Sci. Nat. du Maroc, 16: 144-145, 1937.—From a résumé of this paper in the Ornithologische Monatsbericht, 45: 149, 8 July 1937, it appears that the hitherto inaccessible upper parts of the Djebel Toubkal (4165 meters), the highest part of the Great Atlas in Morocco, have now been visited, and as long ago anticipated by Hartert, have yielded several breeding birds of European affinities, including *Pyrhacorax pyrrhacorax*, and *P. graculus*; *Rhodopechys sanguinea aliena*, of which three specimens were taken forty years ago in the Great Atlas, but since then not found; *Phoenicurus ochruros gibraltariensis*, found breeding above 2000 meters for the first time in Morocco; and *Prunella collaris* of which two specimens taken are the first from French Morocco.

LLOYD, BERTRAM. On the behaviour of male Mallards with broods. British Birds, 30: 334-336, Apl. 1, 1937.—While the male Mallard does not ordinarily take any care of his progeny, leaving their guidance and defence to the female, yet in 1936 exceptions to this rule were observed at the Tring Reservoirs, where in five instances broods of young ducklings were seen accompanied by a male and a female adult, apparently the parents. In each case the company-keeping behavior of the Mallard drakes and their evident concern in the families "left no doubt that the association was a real and not a fortuitous one."

LÜDERS, OTTO. Ueber Ortsbewegungen des Waldkauzes (*Strix a. aluco*). Der Vogelzug, 8: 54-57, April 1937.—A study of the Wood Owl in Germany by means of banding, shows that the adult birds are sedentary. Up to an age of from twenty days to two months, before they are strong on the wing, the young remain in the

- neighborhood of their nest site, although individuals may move off as far as ten kilometers. At the age of from two to eight months the true dispersal takes place, and they then are found at distances from ten to fifty kilometers from their starting point. This dispersal movement ends at from nine to twelve months of age. The greatest distances from their original nest site hitherto established are 210 and 300 kilometers.
- MATHEWS, GREGORY M. Notes on New Zealand ducks. *The Emu*, 37: 31-32, July 1, 1937.—The author's views as to the narrow limits of genera and species, result in the erection of a new subgenus, *Zesarkaca* for the New Zealand Paradise Duck, distinguished from *Casarca* by its different color and wider, blunter nails. A new subgenus, *Zeafulix*, is proposed also for *Anas novaeseelandiae* on account of its lacking the long head crest of *Fuligula*. The North and South Island ducks of New Zealand belonging to the species *Elasmonetta chlorotis*, *Zeafulix novaeseelandiae* (now used in a generic sense) and *Hymenolaimus malacorhynchus* are in each case found to be subspecifically different and new names are provided.
- MAYR, ERNST. Birds collected during the Whitney South Sea Expedition, XXXII. On a collection from Tanna, New Hebrides. *Amer. Mus. Novitates*, no. 912, 4 pp., Feb. 27, 1937.—In 1936, L. Macmillan visited the island of Tanna in the southern New Hebrides group, and made a thorough collection of birds, some twenty species of which were previously unrecorded from the island. A comparison of material from the northern and the southern islands, indicates that there are distinguishable races of certain species in these two parts of the group. Four are thus described: *Zosterops lateralis macmillani* from Tanna; *Z. flavifrons efatensis* and *Myzomela cardinalis tenuis* from the northern islands; and *Myzomela cardinalis tucopiae* from Tucopia Island.
- MAYR, ERNST. Birds collected during the Whitney South Sea Expedition. XXXIII. Notes on New Guinea birds. I. *Amer. Mus. Novitates*, no. 915, 19 pp., Apl. 10, 1937.—This number is a brief review of the swiftlets of the genus *Collocalia*, except for such well-defined species as *esculenta*, *trogodytes*, *gigas*, *whiteheadi* and *lowi*. Attention is chiefly devoted to the species *vanikorensis*, of which a series of over two hundred specimens was available, from various island groups in Oceania. A close study indicates that on these groups the populations tend to become slightly differentiated so that at least ten races are here distinguished of which four are described as new. Over much of its range, a second species, *C. hirundinacea*, occurs with *C. vanikorensis*. The differential characters of the two species are carefully pointed out.
- MAYR, ERNST. Birds collected during the Whitney South Sea Expedition. XXXV. Notes on New Guinea birds. II. *Amer. Mus. Novitates*, no. 939, p. 1-14, July 21, 1937.—The present paper includes notes on various cuckoos, owls, frog-mouths, kingfishers and hornbills of the Papuan region. In spite of sundry older records for the European Cuckoo the author has seen no authentic specimen from New Guinea, and suggests that at least some of these refer to *Cuculus optatus*. A new *Centropus* (*C. bernsteinii manam*) is described from Manam Island. *C. phasianus nigricans* is shown to be restricted to the south coast of southeastern New Guinea, and two additional races are named. A new genus, *Uroglaux*, is proposed for the long-tailed owl, *Athene dimorpha* Salvadori. It is suggested that since New Guinea records for *Eurostopodus mystacalis* are all in the southern winter, the species is perhaps a winter visitor from Australia. A new race of hornbill, *Rhyticeros plicatus jungei* is named, to include birds of northern and eastern New Guinea which average larger than those from other parts of the island.

- MAYR, ERNST. The homing of birds. *Bird-lore*, 39: 5-13, 1937.—A timely summary of recent views and experimentation on the homing of birds, in which 'homing' is defined as the 'ability to return to a known goal over an at least partially unknown flight-route', thus distinguishing it from the fall migration of immature birds that fly toward an unknown goal. Experiments carried out with nesting Starlings in Germany prove that a percentage of the birds return to their nest boxes even though transported as far as 439 miles distant, and the results are not essentially different when birds are released from localities far to one side of their presumed normal migratory flight line. As yet no adequate explanation is available, for the 'retracing theory' as well as that of 'knowledge of geographic position' fall down. Nor is there any evidence that electrical or magnetic fields are perceived by birds as a help in orientation. It is pointed out that in the case of homing birds there is a constant stimulus in the form of the known goal which acts as a directive influence.
- MEYER, OTTO. Australische Zugvögel im Bismarckarchipel. *Ornith. Monatsber.*, 45: 48-51, Mar. 10, 1937.—Three Australian birds, the Shining Cuckoo (*Chalcites lucidus*), the Sacred Kingfisher (*Halcyon sancta*) and the bee-eater, *Merops ornatus*, regularly migrate in the southern autumn northward to the Bismarck archipelago. Seven other species also occur irregularly, including a swallow, a kingfisher, a roller, a cuckoo, a hawk and a rail.
- MOORE, ROBERT T. New race of *Chubbia jamesoni* from Colombia. *Proc. Biol. Soc. Washington*, 50: 151-152, Sept. 10, 1937.—This snipe of the Paramo zone of the central Andes of Colombia is a larger-billed and slightly grayer bird than its relative of Ecuador, and is here named *Chubbia jamesoni chapmani*; type from Santa Isabel, Quindio Andes, Colombia.
- MOREAU, R. E. Der Herbstzug von *Lanius c. collurio* über das Mittelmeer. *Der Vogelzug*, 8: 45-47, April 1937.—The author opposes the previous belief that the European Red-backed Shrike in autumn crosses the eastern Mediterranean Sea by a flight along a very narrow front due south from the Aegean Sea to Alexandria. He concludes that the front is wide, covering from 21 to 30 degrees of east longitude and that a large part of the birds cross in a north-south direction instead of passing to the southeast or around the eastern end of the Mediterranean.
- MOUSLEY, HENRY. A study of a Virginia Rail and Sora Rail at their nests. *Wilson Bull.*, 49: 80-84, June 1937.—Both species were found nesting in successive years, each in a separate small cat-tail swamp near Montreal. The Sora seemed much the shyer bird. The nest of this species contained its first egg on May 14, the full complement of eleven eggs on the 24th, while the young hatched on June 7, or fourteen days from the date of laying the last egg. All had gone the following day. In the case of the Virginia Rail the first egg was laid on May 18, the tenth and last on May 27, while the first young appeared on June 13, or seventeen days after the deposit of the last egg.
- MUNRO, J. A., AND CLEMENS, W. A. The American Merganser in British Columbia and its relation to the fish population. *Bull. Biol. Board of Canada*, no. 55, 50 pp., 10 figs., 5 tables, Sept. 1937.—Summary of investigations, several units of which have previously been reported upon. The life history of the bird is discussed in its bearing on the economics of the species; territorial requirements are touched upon in a section on population studies; and there is a brief statement about restrictive factors. For a study of the food habits 363 "stomachs" were available. Aids to identification of the fish-food items are discussed and illustrated. The authors took the unusual but praiseworthy course of studying the food habits of the fishes

preyed upon as a guide to appraisal of economic values, and report upon those of ten species. The findings regarding the Merganser and the fishes are presented both by localities and in summary. The outstanding foods of the fish duck are freshwater sculpins, salmon eggs, Salmonidae (char, trout, salmon), and sticklebacks. A great many of the eggs consumed are waste and were evidently dead when eaten. Considering all aspects of the problem in the light of their very thorough investigation, the authors conclude "that the American Merganser does not affect adversely the production of trout and salmon to an appreciable degree, because its numbers are not excessive and its food consists to a very large degree of coarse and undesirable fishes." This conclusion does not preclude the idea that control may be locally desirable but control efforts should be undertaken only where proper biological investigation shows them to be warranted. "When special measures of control are necessary they should be regarded as a corrective for a temporary abnormal condition and not as a permanent policy. In such special habitats as rearing ponds, or where fish cultural activities are concentrated, there may always be a need for control. A general reduction of American Mergansers on the assumption that at some time or in some place they may cause losses of trout or salmon is considered an unsound and unwarranted procedure."—W. L. M.

NICE, MARGARET MORSE. Curious ways of the Cowbird. *Bird-lore*, 39: 196-201, 2 figs., 1937.—On Interpont, Ohio, eggs of the Cowbird laid in Song Sparrows' nests have been found to hatch in eleven or twelve days, with occasionally one or two days in addition, so that the reputed ten-days' period of incubation is not sustained. As illustrative of the extent of parasitism, 98 of 223 Song Sparrows' nests were found to be parasitized. While 66 unparasitized nests raised an average of 3.4 Song Sparrows, 28 successful but parasitized broods averaged only 2.4 Song Sparrows so that each Cowbird reared costs one Song Sparrow. With an abundance of Cowbirds, individual territories do not seem to be kept, but may be shared; each bird usually ranges over about twenty acres. Various other notes on habits are given.

OLIVER, W. R. B. The Wrybill Plover. *The Emu*, 37: 1-4, pl. 1 (col.), July 1, 1937.—The beautiful colored plate and the summary of our knowledge of this remarkable bird afford timely information. First described in 1830 by the naturalists of the Astrolabe expedition, it has been only in recent years that accounts of its habits have been available, for the paper of Pitts in 1870, giving the first general account of it, has only been supplemented by that of Stead in 1932. Though migratory, its passages are limited, for it breeds in shingly areas of the rivers in the South Island of New Zealand, and in the southern autumn (December) migrates to the North Island for the winter. Usually but two eggs are laid, and the young when hatched already have the tip of the bill bent about twenty degrees to the right. Since the shingly areas where it breeds and in which its colors are well adapted for concealment, are likely to persist, its chances of escaping extermination for a good while to come seem assured. The curious asymmetry of the bill remains without adequate explanation.

PETTINGILL, OLIN SEWALL, JR. The New Hampshire hummingbirds. *Bird-lore*, 39: 191-195, 2 figs., 1937.—The success with which Ruby-throated Hummingbirds have been attracted to the Webster home may be estimated when in the course of an hour at least fifty individuals came to the vials of sugar solution prepared for them. These vials are adorned with brilliant red, since experience showed that the birds are attracted more quickly to those that are thus marked. The photographic illustrations are from pictures taken by Professor Harold E.

Edgerton with a special high-speed camera, by which the motion of the birds' wings is successfully 'stopped', with an exposure of about fifty feet of film per second. A study of the film shows a rate of from fifty to fifty-five wing beats per second while hovering, and seventy-five per second in forward flight.

PHILLIPS, JOHN C. Man's influence on Ruffed Grouse populations. Suggestions for further investigations. sm. 8vo, 24 pp., privately printed, Cambridge, Mass., 1937.—In spite of much surmise, the sum total of man's influence on the Ruffed Grouse is still hard to estimate accurately. The greatest single factor for destruction of the birds is the gun. In much-hunted territory, probably one half the grouse inhabiting it are annually shot, in spite of an obvious increase in the wariness of the birds. Returns show that in years of abundance half a million birds are killed in the State of Maine alone and nearly as many in Pennsylvania.

Under natural conditions grouse probably did not reach very great abundance in primeval forest. Partial clearing of land areas by axe and fire may be beneficial in the resulting aftergrowth of mixed vegetation and cover and for a similar reason this is true also of agricultural decline. On the other hand, extensive fire at breeding time kills many sitting females and over-clearing and clean farming render the areas unsuitable for the birds. The net effect of natural enemies has probably been exaggerated and is doubtless less than that of feral cats, hunting dogs and house rats. The motor car and good roads now make it possible for hunters to cover much wider territory than formerly, but this is somewhat offset by the inaccessibility of back roads which, as edges of forest, are favorite haunts of the birds. The added effect of cyclic decline makes difficult any efforts to carry out regulatory measures.

PUTZIG, P. Von der Beziehung des Zugablaufs zum Inkretdrüsensystem. Der Vogelzug, 8: 116-130, July 1937.—Experiments were made with Black-headed Gulls and Gray Gulls in Germany to throw light on the relation of the internal glands to the abatement of the migratory urge. Castrated birds were, when fully recovered and banded, loosed and some were later recaptured on their normal wintering areas, showing that migration had proceeded independently of the condition of the reproductive organs. Experiments with male Robin Redbreasts by exposing them to artificial lighting during the winter months, resulted in bringing about a strong development of the reproductive organs, though not before the Christmas season. The difference is more noticeable in the testes than in the ovary, and takes place much earlier than in control birds under normal lighting for that time of year.

ROBINSON, H. W. Recoveries of Gannets from the Bass Rock. Scottish Naturalist, p. 133-134, Sept.-Oct. 1937.—Over a period of five years 349 young Gannets have been banded on Bass Rock, of which twenty-two recoveries are here listed. Of these five are from the French coast, one each from Spain and Portugal, while the most southern are single birds each from Casablanca, Morocco, and Rio de Oro, West Africa.

SCHILDMACHER, H. Zur Physiologie des Zugtriebes. III. Versuche mit künstliche verlängerter Tagesdauer. Der Vogelzug, 8: 107-114, July 1937.—Experiments were made to test the effect of artificially lengthened day on two migratory species. Three males and a female Robin Redbreast in Germany were daily exposed to the light of a 60-watt lamp until midnight, from January 18 till May 12. In contrast to four male controls, they showed a premature urge to migrate and in two of them, a premature moult set in. Three male European Redstarts lighted for increasing lengths of time from September 23 to December 16 up to one and a half hours

beyond normal, showed no obvious falling off of the migratory urge and no ripening of the testes. On the other hand, a male lighted an hour and a half daily from Nov. 12 on, showed a ripening of the testes and a falling off of migratory urge between November 23 and December 13. Six other male Redstarts given a daily exposure to a 75-watt lamp of from 19 to 33 hours between May 15 and July 2 showed a somewhat earlier autumnal moult extending into September. With the onset of moult, the migratory urge fell off.

SCHNURRE, O. Zur Frage der Familienauflösung beim Vogel. Beitr. z. Fortpflanzungsbiol. d. Vogel, 13: 125-127, July 1937.—In the study of the dispersal of broods of the Wood Owl, and presumably in the case of birds in general, the author considers three possibilities: (1) the simultaneous awakening of the desire of the young birds to leave their parents and the desire of the parents to leave their young; (2) the onset of the desire of the young to leave their parents before the desire for isolation develops in the latter; and (3) the converse of the last, that the urge to leave the young may arise in the parents before the opposite is manifest in the young. In the last case the young are actively driven away from parental territory, in the second the parents seek to follow and minister to the young in spite of apparent desire of the young to be independent of them; while in the first case, the young merely depart and leave the parents in sole possession of the territory.

SCHUZ, E. Ringfunde europäischer Rauchschwalben (*Hirundo r. rustica*) in Afrika. Ornith. Monatsber., 46: 136-144, 2 text-figs., July 8, 1937.—The Common Swallow of Europe is well known to winter in Africa, from Senegal southward to the Cape of Good Hope. There are now available fifty-seven captures of banded birds of this species from this area. On plotting these it is seen that the greater part of the returns from the Bight of Benin and the Congo basin are of birds banded in Germany, with a few from Denmark and Sweden; while of the birds retaken in eastern Cape Colony and Natal, most are birds banded in England and Scotland, with a very few from Germany and Sweden. There are thus on the whole rather definite and separate wintering areas for the birds from these European countries.

SOUTHERN, H. N. The supercilium of the Grey-headed Wagtail. British Birds, 31: 101-103, fig., Sept. 1, 1937.—The character distinguishing the Swedish race, *thunbergi*, of the Grey-headed Wagtail is the obsolescence of the white superciliary line in the male bird. In females, however, it is more or less developed, sometimes well marked, especially behind the eye, while in the young it is well evident. In the typical race it is present and clearly developed. The conclusion is that its obsolescence in *thunbergi* is a progressive character of this race.

SPAULDING, NINA G. Studies of the nesting activities of Latimer's Vireo (*Vireo latimeri* Baird). Journ. Agric., Univ. of Porto Rico, 21: 17-28, pl. 2-4, Jan. 1937.—This study was made in western Porto Rico, where Latimer's Vireo is found in tangled low scrub. Its song, nest, eggs and behavior in the breeding season are described. Each pair maintains a well-defined territory, most easily determined at the time preceding the mating when the male is daily heard singing from certain confines. This commences at least by late January. The female sings also but her singing is confined to the courting period. At such times the two birds of a pair sing responsively, and birds of adjacent territories may do the same. The pendant nest invariably overhangs an open space in a thicket; the usual number of eggs is three. Both sexes share the incubation, but the female apparently takes the larger share, although after the young are hatched the male is more active in feeding the young than is the female.

- STEINFATT, OTTO. Aus dem Leben des Grossbuntspechtes. Beitr. z. Fortpflanzungsbiol. d. Vögel, 13: 144-147, July 1937.—The two sexes of Greater Spotted Woodpecker live for the larger part of the year separate though apparently having part of their hunting and living territory in common, so that they more or less keep in touch. The male and female incubate alternately, and at first both devote themselves to rearing the young, which sooner or later the male alone cares for, just as he also takes the chief part in the incubation. The male alone incubates the eggs at night or broods the young in the nest during the night. Incubation begins before all the eggs are laid, at least by the deposition of the fourth egg, and requires twelve days, after which twenty-one or twenty-three days elapse before the young leave the nest.
- STONER, DAYTON. Records of bird temperatures. Circular N. Y. State Mus., no. 19, p. 1-16, July 1937.—Temperatures of twenty-nine species of eastern birds are here recorded. Data for a family of young Belted Kingfishers showed a consistent increase of four or five degrees F., after thirteen days. Similar observations on a brood of Phoebe showed an increase of from about 101 to 102 degrees at a day or two after hatching, to about 107 to 108 at the end of two weeks, nearly twice as great an increment as in the young kingfishers. Extensive data for Bank Swallows show a mean temperature in adults of 106.8 degrees, with a maximum of 112.4 F. A regular increase in the body temperature of nestling Barn and Cliff Swallows is noted, beginning in the first days of nest life at a mean of 98.2 degrees F. for the former and 100.2 for the latter, and attaining about 107.5 in about eighteen or twenty days. Among those showing the highest temperatures, is the Eastern Robin, with a mean in four adults of 111.2 degrees F.
- STRESEMANN, E. Ein neuer Fund von *Neodrepanis hypoxantha* Salom. Ornith. Monatsber., 45: 135-136, July-Aug. 1937.—Salomonsen in 1933, described this Madagascar species from two skins found in the collection of the British Museum, and taken in the forest east of Tananarive in 1881. Now a third specimen has turned up in a German museum, taken by J. M. Hildebrandt in rain forest near Andrangoloaka, central Madagascar, in November 1880, as well as two others taken by the same collector at the same time and place and now in the Berlin Museum. The town at this locality no longer exists. It was situated in the higher part of the east scarp of the plateau, a little east of Antsirabe and is now quite denuded of forest so that it is no longer suitable for this species, which is supposed now to be extinct; at least nothing was found of it by the recent Franco-Anglo-American expedition.
- SUTTON, GEORGE MIKSCHE. The juvenal plumage and postjuvenal moult of the Chipping Sparrow. Occ. Papers Mus. Zool., Univ. of Michigan, no. 355, p. 1-5, June 28, 1937.—A young bird reared and observed from day to day carried no red-brown feathers in the crown; these appear when the bird is about four weeks old, and may be part of the first-winter plumage. The postjuvenal moult begins when the bird is about thirty days old. The juvenal middle and greater coverts drop out almost simultaneously when the bird is about six weeks old. The body plumage is renewed more slowly, but the streaked feathers of the under parts are all gone at forty-five days. The remiges and rectrices are not lost at the postjuvenal moult, but the tertials are, and fall after the middle and greater wing coverts.
- VAIDEN, GORDON. Feeding and nesting of the Mississippi Kite. The Migrant, 8: 45-47, pl., Sept. 1937.—Brief notes are given on the nesting of this kite as observed in the vicinity of Rosedale, Mississippi. One pair of birds, presumed to be

the same individuals, continued to nest in the same woods for at least seven years, until the area was cleared. A remarkable concentration of these kites is described as occurring in late May, 1937, to feed on the abundant adults of the periodical cicada then emerging. On May 20 no less than thirty-four birds were counted. Two collected for specimens contained respectively fifty-one and forty-two of the insects. A great many of the insects were taken on the wing from the trees, others in flight.

VAN TYNE, JOSSELYN, AND SUTTON, GEORGE MIKSCH. The birds of Brewster County, Texas. Misc. Publ. Mus. Zool., Univ. of Michigan, no. 37, 119 pp., col. frontispiece, pl. 1-5, Aug. 1937.—This summary of field work extending over several years in the Great Bend region of western Texas, gives a brief account of the itineraries of the several trips, and is followed by a carefully annotated list of the birds found. In all, 239 species or subspecies are listed of which 86 were determined to nest in the region. Five additions to the known fauna of the United States were made, namely, *Lampornis c. clemenciae*, *Colaptes cafer nanus*, *Phainopepla n. nitens*, *Vermivora crissalis* and *Icterus c. cucullatus*. Eleven others are new to the Texas list. The work has resulted in the finding of three or four new races, one of which, the Towhee of the Chisos Mountains, is here described, *Pipilo maculatus gaigei*. Two others have been described in previous papers. The single specimen of Turkey Vulture proves to be a typical *Cathartes aura*. The colored plate shows the newly described *Buteo jamaicensis fuertesi*, with its pale under parts. At Maravillas a male of this form was found mated to a female of the darker, more northern race, *calurus*, supposed to be a case of a migrant bird having mated with the paler form and failed to go north.

WAGNER, H. O. Der Einfluss von Aussenfaktoren auf den Tagesrhythmus während der Zugphase. Der Vogelzug, 8: 47-54, April 1937.—In this study of the influence of external factors on the daily rhythm during the migratory period, it was found that with experimental birds, the nocturnal restlessness expressing the migratory urge can be partially or completely overcome by increasing the amount of food given. High temperatures retard, lower temperatures increase the nocturnal activity. In absolute darkness caged migratory birds at the season of passage become completely quiet.

WALTON, ARTHUR. On the eclipse plumage of the Mallard (*Anas p. platyrhynchos*). Journ. Exper. Biol., 14: 440-447, 1 pl., 1937.—Wild-caught Mallards which received artificial lighting in the middle of December, showed sexual activity three weeks later and began to moult into the eclipse plumage early in February, three months earlier than normal birds. A second experiment was a failure. Castration of male Mallards did not prevent the assumption of eclipse plumage in the first year, but did so in the second. The author apparently did not investigate whether the loss of the eclipse plumage was due to an upset of the moulting mechanism, as Kuhn suggests, or due to an actual change in the hormonal condition.—E. MAYR.

WEAKLY, HARRY E. The Whooping Crane at North Platte, Lincoln County [Nebraska]. Nebraska Bird Review, 5: 58, July 1937.—Of this fine bird, continued reports indicate that small numbers still pass to and fro on migration. A flock of thirty-one birds including but three in immature plumage, was observed on the North Platte River, proceeding westward, May 4, 1937.

WOOD JONES, FREDERIC. The olfactory organ of the Tubinares. Part II. The development of the nasal tubes of *Puffinus tenuirostris* Temminck. The Emu, 37: 10-13, pls. 3, 4, July 1, 1937.—In the embryo it is shown that the nasal tubes are

lateral, as they are in the albatrosses, and that this, as has been believed, is probably the retention of a primitive condition, but the usual statement that in the adult the tubes are 'not separated by the culmen' is not strictly true, for a section of the bill shows that the change which takes place consists in the approximation of the tubes through the relative diminution in breadth of the intervening culmen which always remains, separating them in the midline.

WYNNE-EDWARDS, V. G. *Sea-birds at Percé, Province of Quebec*. 8vo, Montreal, 32 pp., Gnaedinger Printing Co., 1937.—The many visitors to Gaspé will find this a convenient brief account of the eleven common seabirds that are to be found nesting there in the brief summer. For each species, a short description is given and some account of the habits, so that the booklet forms not only a guide to what species may be found but also an attractive souvenir of the visit. A number of excellent black and white sketches of the birds in characteristic attitudes or of the heads to show markings, add to the facility of identification, while the last five pages are left blank for "Notes."

CORRESPONDENCE

THE NAME 'BLACK-POLL WARBLER'

Editor of 'The Auk':

The suggested changes in the spelling and hyphenating of the vernacular names of birds recommended by Messrs. Cheesman and Oehser in the July 'Auk' are undoubtedly good in the main and make for uniformity, though one may balk a little at 'Chuckwillswidow' and 'Waterturkey.' There is one change, however, that we really must protest against. That is 'Black-poll Warbler' for 'Black-poll Warbler'. In his original description of the species as *Muscicapa striata* in 1772, Forster gave it the English name of 'Striped Flycatcher,' but this inaccurate name did not stick, and Latham in the second volume of his 'General Synopsis of Birds,' bearing date of 1783, called it the 'Black-poll Warbler,' a name that appears to have been universally used ever since. Let us not now change it for mere consistency's sake. Consistency has been called a jewel, but let us beware of that particular kind of consistency that Emerson tells us is the bugbear of a certain type of mind.

FRANCIS H. ALLEN

West Roxbury, Mass.

PSYCHOLOGICAL TERMINOLOGY

Editor of 'The Auk':

The work of Dr. Konrad Z. Lorenz on the instinctive behavior of birds is the greatest that has ever been done in that field, and we owe him a debt of gratitude for his article in 'The Auk,' vol. 54, pp. 245-273, July, 1937, which summarizes his work. The article is written in beautiful English, but two of its most important words are wrongly formed, and they should be corrected, in order that the incorrect forms may not be used by other writers. The two words are "perceptory" (used throughout the article, beginning at p. 247, twelfth line from bottom) and "receptory" (in the heading at the top of p. 261, and in the text, beginning at p. 248, tenth line from bottom). These words should be 'perceptual' and 'receptual.'

WALLACE CRAIG

280 Hamilton Street
Albany, New York

NOTES AND NEWS

THE Ninth International Ornithological Congress will be held at Rouen, France, from May 9 to 13, next. On the first day, registration of members will take place and the Congress will open at the Town Hall, after which there will be an evening excursion. The next three days will be occupied with meetings of the sections, a visit to the natural-history museum and a soirée at the Théâtre des Arts. There will also be short excursions to Clères, the Valley of the Seine, and the Forest of Brotonne. On the night of May 12, a banquet will be held, and the program of sectional meetings will be concluded on the 13th. For May 14 and 15, a visit to Paris and a reception at the Museum and its associated establishments will take place after which there is planned a longer excursion of four days to the famous Carmargue district. The sessions will be held in four sections: taxonomy and zoography; anatomy, physiology, paleontology and embryology; biology; applied ornithology.

The fee for those attending is one pound sterling, with an additional charge of ten shillings if accompanied by a lady. Titles of papers as well as requests for further details of information should be sent as early as possible to M. Jean Delacour, Secretary, Chateau de Clères, Clères, Seine Inférieure, France.

Preceding the Congress, on May 6 and 7, there will be meetings of the International Committee for Bird Preservation, at which questions concerning the protection of birds will be dealt with.

THE Royal Australasian Ornithologists' Union proposes, if sufficient new material of interest is forthcoming, to make the July 1938 issue of 'The Emu' a memorial number to mark the centenary of John Gould's visit to Australia. His great folio works on the birds and mammals of that commonwealth rival those of Audubon. Any pertinent information that may be deemed useful, such as extracts from diaries or copies of letters, is earnestly solicited and should be sent to C. E. Bryant, Esq., Editor of 'The Emu', 394 Collins St., Melbourne, Victoria.

The Royal Australasian Ornithologists' Union was founded in 1901 with the object of popularizing the study and furthering the protection of native birds. To this end it publishes a quarterly journal, 'The Emu', devoted to Australasian ornithology and has issued an 'Official Check-list of Birds of Australia' (price five shillings). In support of the fine work which the Union has carried on, it is making serious efforts at this time to enlarge its membership, and extends to members of the American Ornithologists' Union who may be interested, an invitation to join. The annual charge is 21 shillings, payable in July in advance. Applications should be addressed to the Hon. General Secretary, 170 Latrobe St., Melbourne, Victoria.

IN an effort to increase present knowledge of the migration, winter distribution, age and plumages of the Herring Gull, the Linnaean Society of New York is sponsoring a plan for the extensive banding of these birds. The operations were limited in 1937 to ten stations from Labrador to Block Island Sound. Each station was assigned a particular combination of either one or two colored celluloid bands in addition to the regulation Biological Survey band. The colors used were red, yellow and blue. Since the colored bands are conspicuous, it is believed that accurate sight 'recoveries' will be obtained in large numbers. Ornithologists are requested to record all gulls seen carrying colored bands, noting exactly the relative position, color and, if possible, number of each band. Reports should include the date and place of

observation, and should be sent to GULL SURVEY, care American Museum of Natural History, New York City.

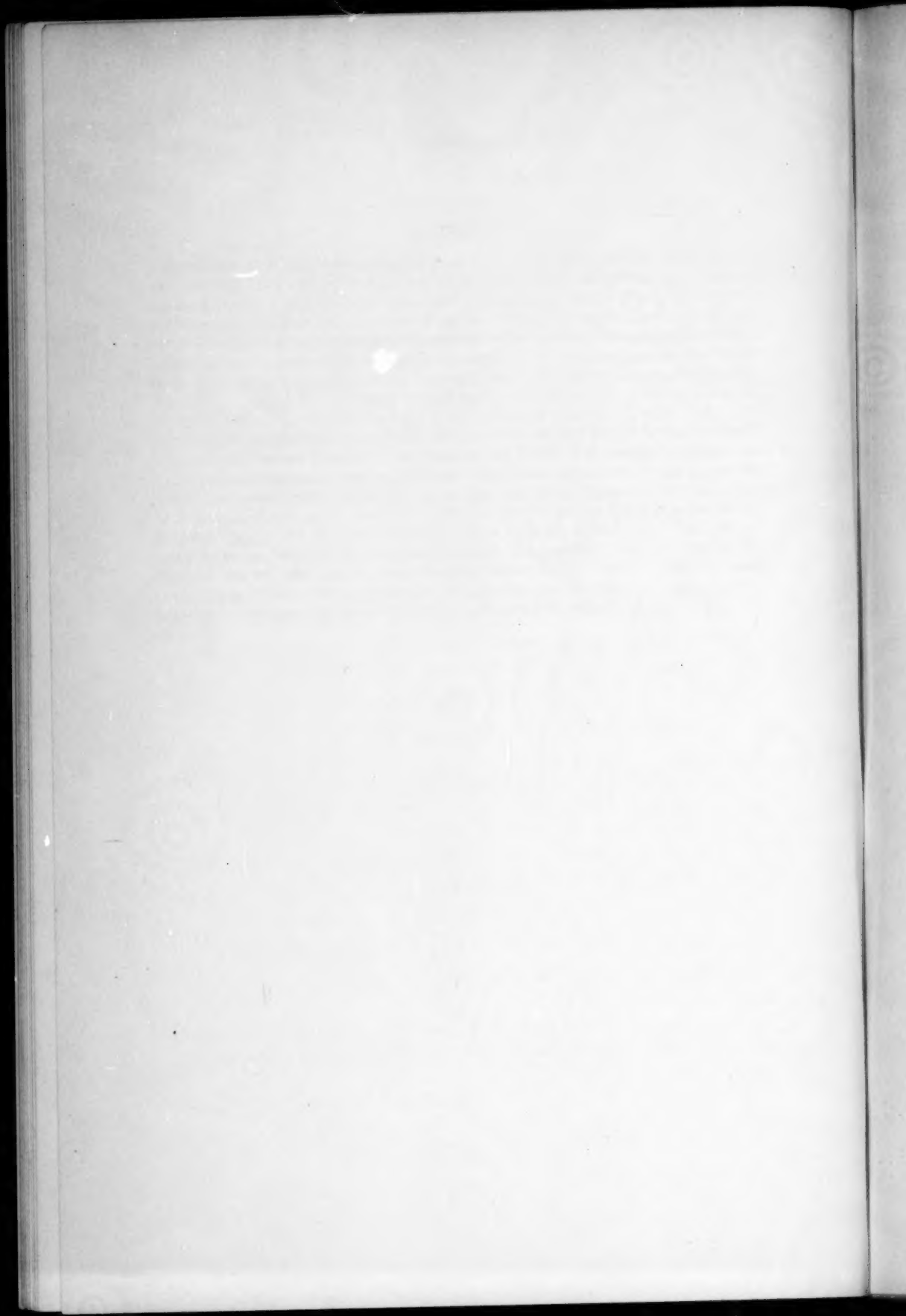
ANNOUNCEMENT is made that a new edition of Witherby's well-known 'Practical Handbook of British Birds' is in course of preparation. Since the publication of the original edition a vast amount of new matter has appeared in print making the needed revision of the text an undertaking of magnitude. The parts dealing with field characters, habitat, song, and habits generally will be greatly expanded. An important feature will be the new illustrations, for it is aimed to show the birds, so far as possible, in all their plumages. Such a series of illustrations has not hitherto been available. The new work will be so largely re-written as to justify its title, 'The Handbook of British Birds.' It is planned to publish it in five volumes at six-monthly intervals beginning next spring. Observations on the passeriform birds, which will be treated in the first volume, are solicited. Notes relating to breeding habits or food may be sent to Rev. F. C. R. Jourdain, Bellevue Road, Southbourne, Bournemouth, and all other notes to H. F. Witherby, Esq., Cobham, Surrey, England.

WANTED: On account of the demand for additional numbers of 'The Auk,' for July 1937, the edition is now exhausted, and any members who do not wish to keep their copy would confer a favor by sending it to the Treasurer, Dr. W. L. McAtee, 3200 22d St. North, Arlington, Virginia.

OBITUARY

LORD LIONEL WALTER ROTHSCHILD, since 1913 an Honorary Fellow of the American Ornithologists' Union, died on August 27, 1937. When but twenty-one years of age he definitely began his career as a naturalist by founding in 1889 his own zoological Museum in a corner of his ancestral estate at Tring, England. To this from time to time he added other buildings to accommodate the great study collections of birds, mammals, and insects which he rapidly amassed. With keen foresight he purchased many large or historic collections of birds and sent out collectors to various parts of the world to secure rare or nearly extinct species and to explore areas little known ornithologically. In this way he built up an unrivalled collection of birds, the major part of which, amounting to nearly 280,000 specimens he sold in 1931 to the American Museum of Natural History. The museum at Tring had become a Mecca for naturalists and its sumptuous publications were known and admired throughout the world. American ornithologists will regret that he could not have lived to carry out his intention of making his first visit to this country to attend the dedication of the Whitney wing at the American Museum, where now the collection on which for so many years he lavished his time and treasure, is adequately housed. Dr. R. C. Murphy writes: "His portly, white-bearded figure . . . will be sadly missed in the Tring countryside, as the loss of his generous and forceful personality will be mourned everywhere by men who study and preserve records of the infinite life on earth."





THE AUK

A Quarterly Journal of Ornithology

ORGAN OF THE AMERICAN ORNITHOLOGISTS' UNION

Edited by Dr. Clover M. Allen

MUSEUM OF COMPARATIVE ZOOLOGY

CAMBRIDGE, MASS.

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